Reg. U. S. Pat. Off

ASTM BULLETIN

SEPTEMBER 1954

Number 200

Telephone: Rittenhouse 6-5315 — **Cable Address: Testing, Philadelphia**

IN THE SOCIETY

GENERAL NEWS NOTES

ASTM Bulletin is indexed regularly by Engineering Index, Inc.

ASTM Bulletin, September 1954. Published eight times a year, January, February, April, May, July, September, October, and December, by the American Society for Testing Materials. Publication Office—20th and Northampton Sts., Easton, Pa. Editorial and advertising offices at the headquarters of the Society, 1916 Race St., Philadelphia 3, Pa. Subscriptions, United States and possessions, one year, $2.75, two years, $4.75, three years, $6.50; Canada, one year, $3.25; two years, $5.75; three years, $8.00. Other countries, one year, $3.75; two years, $6.75; three years, $9.50. Single Copies—50 cents. Number 200. Entered as second class matter, April 8, 1940, at the post office at Easton, Pa., under the act of March 3, 1879.

ASTM BULLETIN

"Promotion of Knowledge of Materials of Engineering, and Standardization of Specifications and Methods of Testing"

Number 200 September 1954

TECHNICAL COMMITTEES AT WORK

A Review of Standardization Activities

An excellent testimony to the fact that progress never stops in the field of standardization is given in the following review of ASTM technical committee activities under way at the present time. The man-hours of time and effort involved are probably beyond calculation. Why is it done? The record of over fifty years of accomplishment by ASTM technical committees testifies to the justification of this tremendous effort in the ever mounting number of standards developed and accepted by industry over these years.

In this September issue of the BULLETIN, as in previous years, a review is presented of many of these important standardization projects. The information is based on current reports of the technical committees and on work programs sent in to Headquarters by the committee officers. For a more complete discussion of some of the items covered or for information on the activities of some of the committees not included here, reference may be had to the annual reports of the committees.

A-1 Steel

Alloy Steel Chain.—A new Subcommittee XXVII on Alloy Steel Chain has been organized and a preliminary draft prepared of specifications for heat-treated alloy-steel chain generally used for slinging, hoisting, and load binding.

Reinforcing Steel.—A special group has been appointed to (1) investigate the application of higher stresses in reinforced concrete design practice, (2) study the types and grades of reinforcement currently used, whether hot rolled, cold formed, cold twisted, cold drawn, prestressed, post-tensioned, bars, rods, or wire, and (3) make recommendations regarding applicable new specifications or revisions to existing specifications needed to control properly the variety of reinforcement types.

Forging.—A task group attempting to correlate the hydrogen content of forgings with mechanical properties is continuing its efforts, with results to date indicating a relationship although the scatter of data is rather great. Another group is being organized to consider writing specifications for closed die forgings. Methods for ultrasonic testing and inspection of heavy steel forgings are in preliminary stages.

Tubular Products.—It is expected that a new tentative specification for electric-fusion-welded steel pipe for high pressure service will be published by the Society this fall, in answer to an urgent request by the American Standards Assn. Sectional Committee B 31 on Code for Pressure Piping. The pipe in sizes 16 in. and over with $\frac{5}{16}$ to $1\frac{1}{2}$-in. walls, is intended to carry liquid, gas, or vapor.

To correlate the grades of welded pipe in ASTM Specifications A 53 and A 135 with API Specification 5L and 5LX it is proposed to revise the tensile requirements in Specifications A 53 and A 135 and the flattening test requirements in Specifications A 53. New specifications for forged and bored austenitic seamless steel pipe for high-temperature service are being developed and a special group is investigating the possibilities of ASTM specifications for welded light-wall austenitic pipe in sizes up to and including 30 in.

Spring Steel.—Two new specifications for chromium-silicon steel spring wire, one for valve spring quality and the other commercial quality, will be ready for publication in 1955.

Bolting.—Progress continues in the development of specifications for transmission tower bolts. It is proposed to add the 10-deg wedge test to Specifications A 307 covering carbon-steel machine bolts and nuts and tap bolts.

In Specifications A 307, A 325, and A 354 the data for the wedge tests will be extended to cover bolts up to 4 in. in diameter.

Sheet Steel.—Specifications A 246 for light gage structural quality flat-rolled carbon-steel sheets is being reviewed since the requirements for the hot-rolled product are out of date and there is a possibility that no mills are currently producing the hot-rolled product.

A-2 Wrought Iron

In line with its return to an active basis during the past several years, Committee A-2 has under consideration tentative specifications for cold-drawn wrought-iron heat exchanger and condenser tubes. The committee is also considering withdrawal of Standard Specifications for Refined Iron Bars (A 41) and the deletion of class B material from Standard Specifications for Wrought Iron Rolled or Forged Blooms and Forgings (A 73).

A-3 Cast Iron

TENTATIVE Specifications for Foundry Pig Iron (A 43) are being scrutinized very closely so that they may be brought up to date and adopted as standard in 1955. Difficulties are being encountered in obtaining agreement on the limits for silicon content.

In 1951 the committee promulgated Specification for Nodular Iron Castings (A 339). Revisions are now being discussed with respect to an increase in elongation requirements for the annealed grade.

A-5 Corrosion of Iron and Steel

FOLLOWING its work in preparing revisions of Method A 309 (triple spot test for weight of coating on long terne sheets) Subcommittee VII on Methods of Test is planning to concentrate its activities on a study of nondestructive methods for the determination of thickness of metallic coatings.

Supplementing the many specifications for wire and wire products sponsored by the committee, work is now in progress on the preparation of specifications for zinc-coated low-carbon steel armor wire, for zinc-coated poultry netting, and for zinc-coated welded steel fabrics.

Also progressing is the work on specifications for zinc coating (hot-dip) on fabricated or assembled steel products, a recommended practice for safeguarding against warpage and distortion during hot-dip galvanizing of steel assemblies, and recommended shop practices and design suggestions for safeguarding against inferior galvanized coating.

The proposed program for a supplementary exposure test of hardware has now reached the point where the number and type of specimens have been decided upon and the subcommittee is now looking toward the acquisition of the necessary test specimens.

B-2 Non-Ferrous Metals and Alloys

SINCE the presentation of the Symposium on Tin at the 1952 Annual Meeting, work has been progressing on the knotty problem of preparing a "classification" of tin. It is hoped that such a classification may be available in another year.

Studies under way at present include a possible revision of the Tentative Specification for Fire-Refined Casting Copper (B 72) and the thorough study of methods of test for continuity of coating of lead-coated copper sheets under Specification B 101.

Titanium is continuing to receive its share of attention. Consideration is being given to possible modifications of Tentative Specifications B 266 (iodide titanium), B 265 (strip, sheet, plate, etc.), and B 264 (ingot) prior to their being recommended for adoption as standard. A new tentative specification for sponge titanium is in preparation.

B-3 Corrosion of Non-Ferrous Metals

ALTHOUGH at present the revision of the Tentative Method of Salt Spray (Fog) Testing (B 117 – 54 T) is a matter of accomplishment, past history concerning the controversies over this method suggests that it may be again in the future the subject of committee investigation. The new acetic acid - salt spray test (B 287) also may be subject to modification based on results of present tests.

A special task group is working on the weighing and tension testing of specimens exposed for 20 yr to the atmosphere at several ASTM test sites. The program includes tension tests on specimens machined before exposure and specimens cut from cleaned 9 by 12-in. plates after removal from exposure. A final report of these tests is expected for use in working up a symposium on atmospheric corrosion for the 1955 Annual Meeting.

Subcommittee VII on Weather is continuing its program of calibrating the corrosivity of various atmospheric test sites by means of zinc specimens and iron specimens. In 1954 and 1955 calibration specimens will be exposed at seven test sites being used for atmospheric corrosion tests by the National Research Council of Canada.

The three-phase program of atmospheric tests on magnesium coupled to other metals has developed to the point where data from two parts of the test program will be incorporated as a part of the symposium referred to above. The couples made by winding wires of one metal in the grooves of threaded spools of the other metal have been exposed, brought in for examination, and the test results are currently being studied. The first of three sets of disk-type couples have been removed from exposure and weight-loss data are being evaluated. Another task group is working on the third part of the program for which galvanic couples will be made by fastening bars of other metals to magnesium plates and the extent of galvanic corrosion in the atmosphere will be determined by tension tests on specimens machined from the exposed panels. Preliminary tests are being made to determine the form of couple to give best results.

B-4 Metallic Materials for Electrical Heating, Resistance, and Electronic Applications

FIVE laboratories are currently checking results of tests designed as a basis for revision of the Standard Method of Test for Change of Resistance with Temperature of Metallic Materials for Electrical Heating (B 70).

Tests are in progress on small heating elements having a base composition of 80 per cent nickel - 20 per cent chromium with respect to variations in carbon, manganese, and silicon.

Work is continuing on creep tests, as well as a study of the advantages of heat treatment, for heat-resistant alloys. Further work includes the study of testing methods for flexibility, hardness, and electrical properties of thermostat metals.

Subcommittee VIII on Metallic Materials for Radio Tubes and Incandescent Lamps is continuing its activity in several specialized task groups.

Work is in progress on collapse strength and measurement of camber with relation to cathodes.

The Gas Analysis Group is studying vacuum fusion analysis for small amounts of carbon and gas in small samples of nickel.

The Chemical Analysis Group, having developed, with Committee E-3, methods of analysis for determination of calcium, iron, manganese, and titanium in cathode nickel, is now planning work on copper, aluminum, and silicon.

The Advisory Committee of ASTM Committee A-1 on Steel at a luncheon during the Annual Meeting in Chicago. Clockwise: R. E. Wiley, Bureau of Ships, USN; H. H. ZurBurg, Chrysler Corp.; C. L. Clark, Timken Roller Bearing Co.; C. A. Kelting, Consolidated Edison Co. of New York; A. O. Schaefer, Midvale Co., an ASTM Director; G. A. Remley, Westinghouse Electric Corp.; H. B. Oatley, chairman of A-1; J. W. Caum, ASTM Staff; L. H. Winkler, Bethlehem Steel Co.; J. G. Morrow, Steel Co. of Canada, Ltd.; H. H. Morgan, R. W. Hunt Co.; A. C. Weber, Laclede Steel Co.; C. E. Loos, U. S. Steel Corp.; W. S. Scott, Republic Steel Corp.; R. W. Mooty, Tennessee Coal & Iron Div., U. S. Steel Corp.; M. B. Higgins, consultant; W. F. Collins, New York Central System; C. F. Lundeen, Inland Steel Co.

The Cathode Group, in connection with the National Bureau of Standards, is continuing its work on the evaluation of vacuum-melted nickel. Work is progressing on a standard triode and also on methods for interface impedance.

The Spectrographic Analysis group is following a program leading to improvements in procedures based upon the use of nickel oxide samples, which are being prepared and checked by the National Bureau of Standards.

The Section on Mica and Ceramics continues its general survey of the physical and mechanical properties of this material with respect to the needs of the electronic industry.

The Section on Clad and Plated Materials continues its work on proposed specifications for steel strip for radio tubes and incandescent lamp use. This group is considering the problems of limits on thickness, width, and burrs, with better description of the physical properties of these materials.

The efforts of Subcommittee IX on Method of Test for Alloys in Controlled Atmospheres are directed toward carburization research to meet the requirements of the steel-heating industry which desires to raise the carburizing temperature to increase the rate of production. In this connection, test programs are being set up.

The work of Subcommittee X on Contact Materials has continued with its study of the surety of making a circuit test with gold, fine silver, copper, and tungsten contacts.

B-5 Copper and Copper Alloys

Plate, Sheet, and Strip.—Among the subjects being considered for flat products are the preparation of requirements for tin-coated copper sheets; more definite requirements for edge finish; changes in lot size and flatness tolerances for condenser tube plates in Specifications B 171; defining size limits for bearing and expansion plates in Specification B 100; and recognition of the direction of rolling in the selection of tension specimens.

Rod, Bar, and Shapes.—In Specification B 187 for bus bar, rod, and shapes the deletion of the machined bend test and the revision of chemical requirements for type OF copper are being discussed. Other subjects under consideration include alloys with lower nickel content in Specification B 151 for nickel silver; review of the list of alloys and a revision of the copper limit for alloy No. 2 in Specification B 124 for forging rod, bar, and shapes; and a clarification of requirements for test specimens in Specification B 139 for phosphor bronze.

Pipe and Tube.—All the tube specification requirements for Rockwell hardness are being reviewed. In Specification B 75 for copper seamless tube the temper requirements are under study and revisions are planned for the chemical requirements for type OF copper. Other items under study include in Specifications B 111 for condenser tubes, the revision of requirements for the expanding test, dimensional tolerances, and finish; and in Specifications B 13, B 42, B 43, B 75, and B 111 the addition of yield strength requirements for Boiler Code applications. Also, a new specification for copper tube in "Type B" sizes is being prepared.

Wire and Wire Rod.—In Specification B 159 covering phosphor bronze, requirements for wire other than round are being prepared. Specifications for flat copper products with finished edges in sizes wider than presently covered in Specification B 272 are being prepared.

Miscellaneous.—A series of revisions is being prepared in the dimensional tolerance requirements as now set forth in the various wrought product specifications. These revisions include, in the case of dispute or referee test, the choice of instrument for determining various dimensions and are based on studies of the problem over a period of several years. A special task group has reported on the determination of grain size, and this report is being studied to determine whether revisions are necessary in the methods for determining grain size.

B-6 Die-Cast Metals and Alloys

The zinc-base die-casting alloys subcommittee is making progress on the establishment of specification limits for "tramp" elements in these alloys. Only the limit for silicon remains to be set.

Two aluminum alloys which have been exposed to the atmosphere for 10 years in New York City and three aluminum alloys from both New York City and Altoona, Pa., which have been exposed for 20 years will be tested later this year.

Test bars are being prepared to determine the effects of 0.05 to 0.75 per cent iron in brass alloy ZS331A with the aim of raising the iron limit in this alloy if it can be done without any deleterious effects.

B-7 Light Metals and Alloys

A tabulation of the properties and characteristics of magnesium casting alloys is in preparation for subsequent inclusion in the Tentative Specification for Magnesium-Base Alloy Sand Castings (B 80) and Magnesium-Base Alloy Permanent Mold Castings (B 199).

Assistance of Committee E-11 on Quality Control of Materials has been sought in establishing lot sizes to be used in defining a satisfactory sampling method for the frequency of mechanical testing requirements of the specifications under the jurisdiction of Committee B-7.

Specifications are in preparation for anodic coatings for various applications and engineering data on the factors affecting the performance of anodic coatings are being developed.

Two proposals for a recommended practice for temper designations of light metals and alloys currently are being scrutinized to determine which system should be recommended for publication.

B-8 Electrodeposited Metallic Coatings

Of great importance to the plating industry will be the glossary now in preparation of terms used in electrodeposition and allied fields.

A study is under way to investigate the desirability and feasibility of writing specifications for materials used in plating, such as anodes and chemicals, and plated coatings other than those covered by existing ASTM specifications.

A new section has been formed charged with the preparation of a recommended practice on cleaning of metals prior to electroplating. Review of the cleaning cycles in existing recommended practices will be an early part of this work.

The preparation of 800 chromate-treated cadmium-plated panels for evaluating corrosion resistance has been completed, and the panels will be exposed in the near future. Several hundred phosphate-coated panels have been sent to the Naval Research Laboratories for special tests designed to evaluate service performance.

B-9 Metal Powders

A cooperative test program on compressibility of metal powders has been completed and it is expected that a method for determining this property will result. A task group is preparing a test method for determining green strength of metal powders.

Round-robin test programs have been initiated for the three methods presently used for determining particle size of refractory metal powders—permeability, turbidimetric, and photographic.

A complete revision of Tentative Specification for Metal Powder Sintered

Bearings (B 202) is under way, including changes in chemical requirements, radial crushing strength, commercial dimensional tolerances, and the addition of recommended press fits, running clearances, and a standard size test.

Two new specifications for structural parts are being prepared, including one for copper-impregnated structural parts and another for metallic filter materials.

Under consideration in the field of cemented carbides are a method for determination of density, a classification of cemented carbides, and a recommended practice for metallography.

C-1 Cement

QUESTIONS relating to false setting of cement were studied in the past year by the committee but none of the test methods that were used appeared sufficiently satisfactory. Two newly proposed test methods are the subject for study by cooperating laboratories. The introduction of mechanical mixing of the standard mortars led to plans for a critical review of the strength requirements of the present portland cement specifications, and the actual strength deportment of various portland cements. Cooperative studies indicate that the present tentative test for bleeding of cement pastes and mortars is a good test, but further improvements will be sought to secure better agreement among laboratories.

Efforts have been continued to develop further the methods for flame photometry as applied to cement including the investigation of several types of flame photometers. The Tentative Method of Test for the Determination of Calcium Sulfate in Hydrated Portland-Cement Mortar (C 265) is the subject of further cooperative investigation designed to make the test more reproducible among laboratories.

Extensive cooperative study was made of a test for the determination of the potential sulfate resistance of portland cement by measuring the expansion of prisms made of mortar containing excess calcium sulfate equivalent to a total SO_3 content of 7.0 per cent by weight of the cement. The results were promising, and additional tests are now to be made to correlate the results of these laboratory tests and the performances of the same cements in concrete.

Various questions relating to the current cement specifications are the subject of current study, as is also a recently proposed specification for slag cement.

C-2 Magnesium Oxychloride and Oxysulfate Cements

WEAR resistance will have a prominent place in the considerations of Committee C-2. Comparison of the wear resistance of oxychloride cement compositions will be made with competitive flooring materials. The development of a list of definitions of terms will be expedited during the coming year. In addition, important revisions of existing standards are being considered, including the test for ignition loss and active calcium oxide. Two test methods in the development stage are the determination of shear strength of bonding media and the determination of water resistance of magnesium oxychloride cements.

C-3 Chemical-Resistant Mortars

STRENGTH tests of silicate mortars will receive attention by the committee. The development of proposed test methods will include tensile, compressive, and bond strength of chemically setting silicate mortars. Proposed methods for determining water absorption and weight loss of resin mortars are planned for development. Consideration of methods for determining the coefficient of thermal expansion, flexural strength, and service temperature of resin mortars has also been initiated. The evaluation of chemical resistance will continue to be studied as a result of cooperative tests which have been concluded. Attention will also be given to developments in the field of latex-lumnite cements.

C-4 Clay Pipe

THIS Committee is continuing its study of revisions in all of the clay pipe specifications for the purpose of amending their crushing strengths, basing such changes upon sound ceramic engineering data and principles. The new specification for clay flue lining is being reviewed for the purpose of amplifying it with the addition of suitable physical and service qualifications.

C-7 Lime

THE development of specifications in pozzolanic material for use in lime products will be a new field of activity in Committee C-7 which will appoint a new subcommittee for this task. The study of the lime requirements for silicate brick manufacture has been expanded to include sand-lime brick. An additional use of lime for chemical purposes will be investigated in the preparation of a specification for lime for use in the manufacture of hypochloride bleach for paper. Research will be continued on the autoclave test for lime, jointly sponsored by the research and the test method subcommittees.

C-8 Refractories

EXTENSIVE research as applied to the various tests of physical properties of refractories will be continued by Committee C-8. This includes three projects on load tests involving the effect of design factor on modulus of rupture, a miniature hot load test, and temperature distribution in the specimen brick in the standard hot load test. A standardization project at the National Bureau of Standards for a revised table of temperature equivalents of pyrometric cones is expected to be completed this year and will be considered by the committee. The proposed methods for bulk density of granular refractories will continue to receive attention.

Information is being collected on which to base a classification of ladle brick used in the ferrous metals industry. An important addition to the refractories manual is being prepared in the form of microscopic techniques in the study of refractories. Special refractories are receiving attention, with analytical methods for SiC, CaO, MgO, and alkalies under review. Load test methods are also being prepared. In the relatively new field of carbon refractories, test methods are being outlined for measuring reheat, thermal conductivity, permeability, oxidation, analysis for carbon, P.C.E. of ash, apparent porosity, and bulk density. Some progress is being made in the preliminary study of basic granular refractories.

C-9 Concrete

A NEW field of activity now under way in the committee is the development of standards for packaged, dry, premixed materials for mortars and concrete. This work will be carried out in close cooperation with Committee C-12 on Mortars for Unit Masonry.

In the research group of subcommittees, several projects are proposed for consideration during the year or are actually in process. These include the development of a method of test for creep of concrete, the identification of deleterious materials in aggregates for concrete, and a review of methods that can be used as ascertain the various characteristics of aggregate pores.

A number of projects are under way in the group of subcommittees concerned with specifications and test

methods, many of which are working on revisions and refinements of existing standards. In the testing of fresh concrete, methods are being considered such as the Washington meter apparatus for determining the amount of entrained air and the Kelly Ball penetration method of test for consistency of fresh concrete. Work continues on color standards for the Method of Test for Organic Impurities in Sands for Concrete (C 40). Tests to determine the tensile breaking strength of waterproof paper for curing concrete, as specified in Method C 171, will be conducted during the year at three laboratories.

A new test series has been initiated on the study of the resistance of concrete to abrasion. Specimens are fabricated by one laboratory and distributed to the cooperative laboratories for testing. The main purpose of this latest test series is to incorporate corrective measures and precautions which have been suggested from the earlier test series. Work is to be continued in an effort to develop a test method for setting time of concrete, using sonic apparatus and thin-wall cylinders. The possible use of the Hveem stabilometer will also be considered.

C-11 Gypsum

The development of a proposed method for the determination of mold resistance of gypsum wallboard and gypsum formboard papers has been initiated in Committee C-11. The requirements for aggregate for use with gypsum plastering still need further study, and the present subcommittee will be reconstituted to include a wider range of interest. Proposed changes in grading requirements, as presented by consumer interests, will be reviewed, and a special task group will outline an investigation to determine the effect of density of vermiculite on its suitability as an aggregate for plaster. A task group has been organized to develop and recommend a sand gradation specification for Ottawa sand for use in physical testing of gypsum plastering.

C-12 Mortars for Unit Masonry

Active research continues in the committee on the pointing of mortars and on tests for the subjective properties involved in workability and plasticity. Attention is also being given to reinforced brick masonry and the specifying of properties to secure more wall strength by adequate attention to the area of contact factor. Shrinkage cracking is also a current problem of much interest. Cooperative tests will be conducted, using local sands with their natural grading, in comparison with the grading requirements of ASTM Tentative Specification for Aggregate for Masonry Mortar (C 144) in an attempt to reconcile differences in the requirements for the use of sand in mortar. Efforts are being continued to develop what is hoped to be a final draft of a test method for evaluating efflorescence.

C-13 Concrete Pipe

Several projects are currently being considered by Committee C-13 relating to the revision of existing standard specifications, as well as additional coverage in the concrete pipe field. The desirability of combining specifications C 75 and C 76 (on Reinforced Concrete Sewer and Culvert Pipe, respectively) as well as revising their requirements, is under study. On a long-range basis, there is a comprehensive study of a revision of all concrete pipe specifications based on up-to-date engineering design data. Final drafts of proposed specifications for low-head reinforced-concrete pressure pipe and for low-head reinforced-concrete sewage force mains are in the course of preparation. The need for a specification for precast concrete manholes for access to nonpressure lines is being studied.

C-14 Glass and Glass Products

Committee C-14 has an active program under way in the preparation of revisions of the Methods of Chemical Analysis of Glass Sand (C 146) and of Chemical Analysis of Soda-Lime Glass (C 169). This includes the use of the versene titration procedure. Colorimetric procedures are being considered for determining aluminum oxide, titanium dioxide, chromic oxide, and ferric oxide. As a possible new project, a study is being made on the need for standards on fiberglas, particularly in connection with chemical durability.

C-15 Manufactured Masonry Units

The need of specifications for various types of floor brick, including packing house brick, will be studied by a task group. Active work is contemplated in the new field of waterproofing for unit masonry walls, with the completion or the organization of a new subcommittee for this purpose. Further changes in the proposed tentative specifications for brick-block units will be considered as a result of suggestions received from various sources, both within and without the committee. This proposed specification was withdrawn from

The ASTM Advisory Committee on Corrosion, photographed during the Annual Meeting, is composed of representatives of the several technical committees concerned with the problem of corrosion. Clockwise: C. P. Larrabee, U. S. Steel Corp.; A. W. Tracy, The American Brass Co.; J. G. Thompson, National Bureau of Standards; I. V. Williams, Bell Telephone Labs.; Jerome Strauss, Vanadium Corp. of America; J. S. Pettibone, ASTM Staff; Chairman F. L. La Que, International Nickel Co.; O. B. Ellis, Armco Steel Corp.; M. E. Holmberg, consultant; J. H. Gibbud, Owens-Corning Fiberglas Corp.; F. N. Alquist, Dow Chemical Co.; W. N. Harrison, National Bureau of Standards; R. J. Painter, Executive Secretary, ASTM; ASTM President N. L. Mochel, Westinghouse Electric Corp.

the recommendations of the committee at the Annual Meeting because of these suggested revisions.

A special task group is continuing a study of the desirability of providing requirements for a low moisture-volume change class of concrete masonry units.

C-16 Thermal Insulating Materials

ADDITIONAL specifications are being prepared by the committee in the field of block and pipe insulation. Preparation of proposed specifications for cork pipe covering insulation and for cellular-glass pipe-covering insulation has been assigned to task groups. The preparation of a method of test for determining flame resistance of structural insulating board continues to present problems which have not yet been solved. This problem also applies to blanket insulation and loose-fill insulation. Round-robin tests are continuing with respect to two investigations, for adhesion and for plasticity of wet thermal insulating cement. The determination of density at which loose-fill insulations should be applied is a current project, looking toward preparation of a proposed test method based on data collected to date. Moisture and its effect on loose-fill insulation is also receiving attention.

Sampling and testing procedures in connection with the guarded hot plate method for measuring thermal conductivity are being critically reviewed. An extension of the coverage of the Method of Test for Thermal Conductivity of Materials by Means of the Guarded Hot Plate (C 177) to include low-temperature measurements is being considered. Special thermal properties currently under study include emissivity, for which a proposed test method is in preparation, and maximum-use temperature of high-temperature thermal insulation, for which a proposed test method is now being prepared in final draft form.

Work in the field of coatings accessory to thermal insulation is well under way, with an investigation being made of field requirements needed to set up a test method properly. The problem of sample preparation of coatings is being approached, with a task group preparing a proposed method of making samples. The special research project on the effect of moisture on thermal conductivity, being conducted at Pennsylvania State University, is continuing, with good progress reported to date.

C-17 Asbestos-Cement Products

THE handleability of asbestos-cement products is being studied by Committee C-17 for the purpose of developing test methods to measure this property. Research is also being done on a method of test for organic material in these products.

C-18 Natural Building Stones

DEVELOPMENT of specifications, as well as test methods, for marble, in Committee C-18 hinges to a large degree on research work, which is sponsored by the marble industry and the National Bureau of Standards. The writing of specifications for other types of building stone involves a program of reorganization which is being effected, based on specific materials.

C-19 Structural Sandwich Construction

PROPOSED test methods are being prepared by the committee which will determine compressive strength of sandwich cores, the measurement of core delamination, and of core thickness. Proposed methods for the determination of edgewise compressive strength of sandwich construction, as well as flatwise flexure strength, have been prepared and are now being rewritten in view of suggestions received. An exposure testing program is being prepared for approval by the committee. Various methods of creep testing are being reviewed preparatory to the writing of a recommended practice.

C-20 Acoustical Materials

THE measurement of sound absorption has been an important project in this committee with the completion of a series of tests involving seven different reverberation chambers. A proposed tentative method is being prepared, following an analysis of the test results. An impedence tube method has also been prepared, and is now being circulated. Other methods under study for measuring sound absorption are the comparison or box method and a modified tube method.

Flame resistance or flame spread has received considerable attention, and a subcommittee continues to study the development of test methods. A practical test for determining the effects of painting acoustical materials in respect to light reflectance and sound absorption continues to be studied by the Subcommittee on Maintenance. The application of preformed acoustical materials by use of adhesives is a current subject in the committee and has resulted in the preparation of a proposed specification for acoustical adhesives. The completion of this specification awaits the development of further data for setting up aging requirements. Other basic physical requirements, such as light reflectance and air flow resistance, are being considered with respect to the development of test methods. A group of strength test methods has been prepared, which will now be reviewed for final draft.

C-21 Ceramic Whiteware and Similar Material

ADDITIONAL test methods are being prepared by the committee, on raw materials as well as ceramic products. In the field of raw materials, the evaluation of ceramic and electrical properties of barium titanate dielectrics is being considered. A cooperative test series among ten laboratories is being carried out to determine the effect of variations in firing and silvering operations. Proposed test methods for measuring properties of fired whiteware products are being reviewed. They cover compressive strength, crazing resistance, reflectance, moisture expansion, and impact.

The Subcommittee on Nomenclature continues its development of definitions of terms relating to ceramic whiteware. Research activities have related primarily to subsieve particle size studies and to the re-evaluating of methods for modulus of rupture determinations.

C-22 Porcelain Enamel

DEVELOPMENT continues in Committee C-22 of tentative methods of tests on raw materials and materials in process covering torsion, tearing, evaluation of enameling iron, coefficient of expansion, consistency of enamel slip, fusibility, and the evaluation of certain characteristics of clays. The classification of water used in the milling of porcelain enamel is being prepared, and a study of methods for the disposal of enamel plant wastes is under way. Additional test methods on finished products in process of development include those for the evaluation of abrasion resistance, thickness, thermal shock resistance, chemical resistance, scratch resistance, continuity of coatings, metal marking resistance, impact resistance, and color and color difference determinations for porcelain enamels.

A complete review of Tentative Definitions of Terms Relating to Porcelain Enamel (C 286) is in process, with the view of increasing coverage and general usefulness of the definitions.

D-4 Road and Paving Materials

THERE is considerable activity in the group of subcommittees concerned with measuring the properties of bituminous materials in Committee D-4. Cooperative tests are being conducted to develop reproducibility in the standard distillation tests; the improvement of the control of rate of heating in the softening point test is being studied, as well as the reproducibility of this test; test data from a cooperative series of Engler viscosity tests are being studied to determine reproducibility of a proposed method; data are being assembled for determining reproducibility of the various tests for emulsified asphalts; and search is being continued for a significant method for evaluating the drying or setting properties of bituminous materials, including investigation of the "rolling ball" apparatus. A thorough study has been initiated of a thin-film oven test used for the evaluation of asphaltic materials.

Several important properties of aggregates for which there have been no standardized method of determination are being studied. These include structural strength of coarse aggregate particles, void content of sands, characteristic shape of sand particles, resistance to abrasion of fine aggregate, and the contribution of different types of aggregate to the skid resistance of pavements. Consideration is also being given to the evaluation of deleterious substances in concrete aggregates.

A recommended practice is being formulated on the use of materials for bituminous surface treatments. Information is being assembled for the development of requirements for permanent types of traffic markers. An extensive testing program on preformed fillers for expansion joints is being conducted, which may lead to a review of the present ASTM standards. Specifications for cold-application joint sealers of mastic or emulsion types are being developed, as well as the study of the need for simplifying and clarifying the present specifications for emulsified asphalts. It is planned to prepare a specification for only one grade of the medium-setting type emulsion.

D-5 Coal and Coke

A THOROUGH study of analytical methods for coal and coke is being made for the purpose of revising and adding to the present Methods for Laboratory Sampling and Analysis of Coal and Coke (D 271). Additional determinations for the mineral carbon dioxide content of coal are being considered. Paralleling this work, a thorough investigation of the analytical methods for coal under review by ISO/TO 27 is being made in an effort to utilize the best current knowledge.

Work along new lines considering the moisture-holding capacity of coal and a determination of the fusibility of ash is in progress. A revision of the standard method of test for cubic foot weight of crushed bituminous coal (D 291) is being made to incorporate the now widely used Koppers cone method of loading or measuring boxes.

The recent symposium on coal sampling held at the Annual Meeting of the Society in June, 1954, has added a great impetus to refining of the coal sampling methods, and this work should bear fruit in the near future.

D-6 Paper

IMMERSION testing, a new field for Committee D-6, is under preliminary investigation, as are corrugated medium testers. A concerted effort is being made for the preparation of a specification on heavy duty shipping sack kraft paper. Such a specification is most demanding and will take a considerable amount of time for its preparation.

Further analysis and possible additional tests for the physical test methods for container board have resulted from a series of tests completed in conjunction with proposed revisions of the method of test for puncture stiffness of paper board, corrugated, and solid fiberboard (D 781).

Work on refinements of many other D-6 methods is in prospect as these methods are being carefully reviewed for exactness on subcommittee level.

D-7 Wood

By far the major activity of Committee D-7 at the present time and during the coming year is the conduct of the wood pole research program, for which

Organic Chemicals—A *Forecast*

A SUMMARY of an article, "Raw Materials for Organic Chemicals," by Eugene Ayres, Gulf Research and Development Corp., which appeared in the July 19 issue of *Chemical and Engineering News* is reprinted below. It provides an excellent condensation of information of interest to many BULLETIN readers.

In the next 20 years, these conditions may well determine sources of raw material supply for organic chemicals:

1. The present marked trend away from vegetation will continue, and most chemicals from vegetation will be those from food production by-products offering unique chemical opportunities.
2. Chemicals from dry natural gas will contract rather than expand.
3. Synthetic gas will be largely by-product in character. With low Btu content it will be suitable only for local use. Exception is gas from low-temperature carbonization of coal, which could be transported economically.
4. Fischer-Tropsch conversion of coal will begin to supply (before 1970) substantial amounts of ethylene and other aliphatics, but production of motor fuel by this process will be minor.
5. Rather large production of coal chemicals will be developed from special coal hydrogenation operations specifically for chemicals.
6. Coal hydrogenation will not provide substantial amounts of LPG as starting point for aliphatics.
7. Aromatics production from petroleum will decline.
8. Gas from low-temperature carbonization of coal may be abundant and transportable by pipeline, but will not be as good a source of chemicals as petroleum refinery gas.
9. Tar from low-temperature carbonization of coal should provide cheap and abundant tar acids.
10. Oil shale will not be important as a by-product source of present tonnage organics, but may become important in fields not yet developed.
11. Ethane from natural gas manufacture will become increasingly important for petrochemicals.
12. LPG will continue to be available, at least until 1970, in sufficient quantity and at low enough cost to satisfy chemical demands for propylene, isobutane, isobutylene, and ethylene.
13. Economically recoverable ethylene in refinery gas will be insufficient to satisfy demand. However, yield may be almost doubled by conversion of refinery gas ethane.

sufficient funds were received to start the work the first of the year. Objects of the research program are to provide more reliable and accurate information on the strength of various wood pole species as a basis for specifications and pole line design stresses. More specifically, the tests are designed to determine the strength of full-size poles of the more important pole species, to establish the relation of the strength of small clear specimens to the strength of full-size poles, to determine new information on the effect of various natural characteristics such as knots and cross grain on strength, to study the effect of the commonly used wood preservative methods, and to compare the crib method and machine method of testing full-size poles.

Tests of western larch poles have been completed, and an analysis of the results is under way. Tests by the crib method are currently under way. Scheduled in the coming months is the collection of Douglas-fir, western red cedar, and lodgepole pine for tests during the coming year. The wood pole research program is directed in Committee D-7 by a special technical task group. Contributions are still being invited to support the program from interested agencies on the basis of the two-year program for which the work was scheduled.

D-8 Bituminous Waterproofing Materials

WORK is proceeding in Committee D-8 on consistency tests, particularly in obtaining agreement on two methods which will cover the full consistency range of cold-applied roofing materials. These methods are the Modified Stormer and a lightweight penetration cone method. To confirm previous work more round-robin tests will be made. Subcommittee members have also been asked to submit their views on other properties and methods of test for such properties which should be included in the final specification covering these materials.

A subcommittee is currently studying methods for determining changes in bituminous roofing materials due to decomposition on weathering. A test program of asphalts from three sources is under way involving exposure outdoors at two locations and in the accelerated weathering machine. The weathered films from these exposures will be examined to determine what chemical and physical changes have occurred. The problem of determining the effect of variations in the composition and purity of water on accelerated weathering tests was assigned to a group. Difficulties have been encountered in finding laboratories that would participate in this work and it may be necessary to abandon the project.

The main objectives of a new subcommittee are the development of suitable methods for measuring flow properties of bituminous materials used in water proofing, roofing, and siding products. The subcommittee will attempt to show the meaning of these flow data in terms of types of performance and to strive for simplification and rationalization of consistency testing by the selection, whenever practical, of fundamental testing devices.

A complete revision of the Tentative Method of Testing Asphalt Roll Roofing, Cap Sheets, and Shingles (D 228) is being accomplished with cooperative testing to acquire needed data. A task group will study the desirability of issuing three specifications for the three types of asphalt shingles currently covered by the Standard Specification for Asphalt Shingles Surfaced with Mineral Granules (D 225).

D-9 Electrical Insulating Materials

BECAUSE of the activities of the International Electrotechnical Commission in the field of temperature classification of electrical insulating materials, all the subcommittees of Committee D-9 are putting special emphasis on work to determine the effect of temperature on electrical properties and on temperature stability of these materials. A special section has been set up in Subcommittee XII on Electrical Tests to coordinate these activities in the other subcommittees.

Subcommittee I on Insulating Varnishes will continue its study of the set time for phenol-formaldehyde laminating varnishes and determination of the temperature at which the test should be made. Round-robin tests are being made at the present time. A study is also being made of methods used to determine viscosity of electrical insulating materials.

Subcommittee III on Molded Materials is studying the possibility of using roller electrodes for dielectric strength testing of the entire area of sheet materials. Work is being started on the development of specifications for polyester glass laminated materials.

Subcommittee IV on Liquid Insulation is continuing its study and testing of mineral oil in actual services. Work is being done to evaluate the use of soluble metal catalysts as oxidizing media in sludge formation. Continued effort is being put on the development of improvement of methods for measuring water in oil, metals in oil, dielectric strength, and interfacial tension. Work is also being started on methods for determining the viscosity of oils and peroxides in oils.

Subcommittee VI is working on electrical tests for waxes and on tests for polymerizable embedding materials.

Subcommittee VII on Insulating Fabrics will continue work on methods for testing silicone rubber-glass fabrics and Teflon glass fabrics and will start work shortly on silicone rubber-glass fiber tubing. The subcommittee is making plans to work on specifications for varnished glass fabrics where such do not exist.

Study of the determination of pH in unbuffered paper is being made by Subcommittee VIII on Insulating Papers in cooperation with the joint D-9–D-6 Committee on Paper. Similar studies will be made regarding water-soluble chlorides and air resistance of paper. Work is continuing on surface friction of wrapping paper and elongation of crepe paper.

Subcommittee IX on Mica plans to study Standard Specifications for Natural Block Mica and Mica Films for Use in Fixed Dielectric Capacitors (D 748) with a view to improving electrical test methods for mica.

The problem of power arc resistance is being studied by Subcommittee XII. A study is also being made of the problem of specifying electrodes for electrical tests on this film. Revisions are being made on a method for dielectric strength, and a new method on proof testing is being prepared. Plans are being made to start work on tests for corona resistance of insulating materials.

Subcommittee XIV on Conditioning plans to continue its work on the important problem of measuring humidity in small enclosures.

D-10 Shipping Containers

EXTENSIVE refining of all container test methods is under way in an effort to produce procedures which will have good interlaboratory reproducibility.

New efforts in the committee are being directed toward a method of testing the effect of stacking of corrugated boxes. As the standard test procedure is being developed it is expected that this test will be enlarged to include other types of shipping containers.

Another line of effort is the study of a procedure for the determination of compression set and drift of cushioning materials. A load deflection method for determining the energy absorption

of cushioning materials is now in the final phase prior to its presentation for publication.

D-11 Rubber

A NEW Subcommittee on Synthetic Rubber is being organized to undertake a technical program on specifications and test methods for Government synthetic rubbers when the U. S. synthetic rubber production is turned over to private industry. A new subcommittee is also being formed to plan and sponsor technical programs and symposiums.

The comprehensive Glossary of Terms Relating to Rubber and Rubber-Like Materials is now being reviewed looking toward its publication by the Society.

A new Tentative Recommended Practice for Standard Test Temperatures for Rubber Products has been completed for committee letter ballot. It covers testing temperatures to be employed for the testing of rubber products in those instances where methods contain reference to the recommended practice.

The numerous individual specifications for rubber-insulated wire and cable have been extensively reviewed and will be revised and brought up to date later this year. General specifications which cover the constructional details, materials, and voltage test requirements for rubber-insulated wires and cables used for the distribution of electrical energy have been prepared. The individual specifications will make reference to the applicable portions of these general specifications. In addition, the extensive Methods of Testing Rubber and Thermoplastic Insulated Wire and Cable (D 470) have been completely revised to include the various tests that are required by the individual specifications. There have also been prepared new specifications for ozone-resistant butyl rubber, and for polyethylene insulated wire and cable. It is expected that committee letter ballot on these specifications and test methods will be completed during the summer so they can be submitted to the Society for publication through the Administrative Committee on Standards.

The Subcommittee on Packings completed this year Tentative Purchase Specifications for Sheet Rubber Packing (D 1330) which cover packing or gaskets cut from sheets intended for general gasket applications on water, air, and low-pressure steam lines. For use in connection with these specifications and also for the general SAE-ASTM Specifications for Gaskets (D 1170) the committee has undertaken an investigative program to develop a test method for relaxation of commercial gasketing.

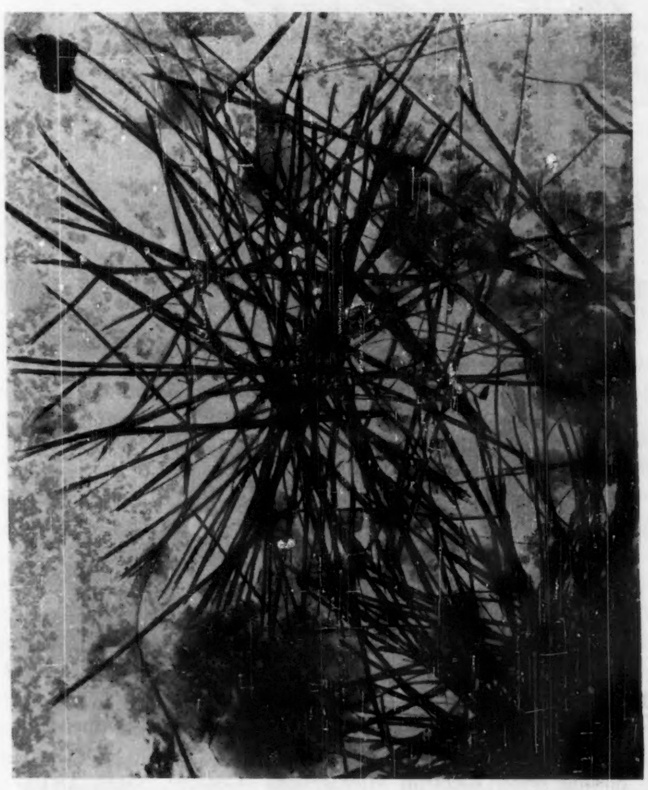
The Subcommittee on Rubber Latices is continuing its cooperative laboratory study of a method for determining volatile fatty acids in latex as a measure of chemical stability. Results of the first round-robin indicate that this method may offer a reproducible test for measuring at least one phase of chemical stability. A procedure for sampling lots of latex in drums has been prepared and is being considered in connection with the International Committee ISO/TC 45 on Rubber. A test method for latex films has been prepared and is also being discussed with ISO/TC 45.

Methods of measuring mill-roll and stock temperatures during processing of experimental rubber batches are being studied by Subcommittee X on Physical Tests. Better control of such temperatures is considered essential for improving reproducibility in preparation of standard compounds and experimental batches for testing. Methods of buffing rubber specimens in order to improve accuracy and reproducibility in testing are also under study.

The procedures for determining copper and manganese in the analysis of rubber products was approved at the June meeting and will be incorporated in ASTM Methods D 297. Work is now being undertaken on a method for determining iron in crude rubber. A task group is being organized to study methods of determining carbon black in vulcanized rubber. The induction furnace combustion method for determination of sulfur is being studied. In view of interest expressed in the use of infrared methods for analysis of elastomeric compounds, a report on such methods will be prepared during the year.

The Subcommittee on Crude Natural Rubber has developed a program for the vulcanization characteristics of natural rubber. Round-robin tests in seven laboratories will be made on three grades of Technically Classified Rubber. The Mooney viscometer method will be used to determine whether it will provide adequate and reproducible information.

The Subcommittee on Abrasion Tests has been endeavoring to determine the type of abrasive and procedure for obtaining it for use in connection with



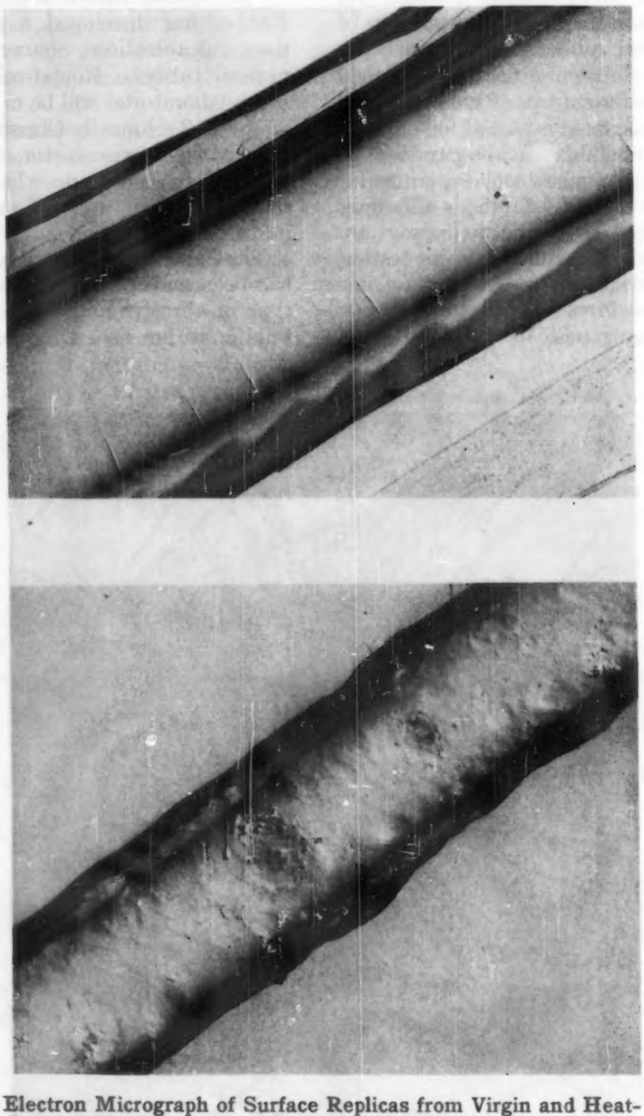
Electron Micrograph of Calcium-Sulfoaluminate Needles (High Sulfate Form) (× 16,000). Reduced for publication.

Third prize, Foreign Electron Micrographs—General. Ninth ASTM Photographic Exhibit. K. Watanabe and T. Iwai, Central Research Laboratory, Ube Industries Ltd., Ube-si, Yamaguchi-ken, Japan.

Standardization Activities

ASTM Method D 394. A questionnaire circulated to members of the subcommittee resulted in the following general conclusions: (1) the two major difficulties encountered with abrasives are nonuniformity and smearing, (2) cutting rate is important but neither a fast nor a slow cutting abrasive is desired, (3) a small majority of the respondents favored a commercial abrasive rather than the establishment of a specially prepared abrasive, and (4) those few expressing an opinion regarding criteria of acceptance for an abrasive favored standardizing the abrasive against a standard reference material. The subcommittee is continuing its study of a satisfactory abrasive paper for this method.

The Subcommittee on Hardness, Set, and Creep has appointed a task group to standardize the Shore D durometer for use in testing stocks of more than 95 Shore A durometer hardness. Another section is planning a program to study the durometer hardness *versus* the ISO hardness scale to determine which is the most reproducible for testing a variety of elastomer stocks. A statistical review of this program will be made before work is begun. A Bibliography on Creep and Relaxation of Elastomers has been prepared including results of tests on 30 GR-S samples together with illustrations of equipment used. This information will be studied during the year before a full scale program is undertaken.



Electron Micrograph of Surface Replicas from Virgin and Heat-Treated Continuous Glass Filaments (× 18,000). Reduced for publication.

Second prize, Electron Micrographs—General, Ninth ASTM Photographic Exhibit. J. G. Sayre, Owens-Corning Fiberglas Corp., Newark, Ohio. Chromium shadowed replicas made by placing glass filaments on wet collodion films, drying, and stripping. Upper micrograph shows surface of virgin filament to be generally smooth. Lower micrograph shows surface of heat-treated filament to be grossly wrinkled and with smaller surface irregularities.

The Subcommittee on Adhesion Tests is making an extensive study of the Tentative Methods of Test for Adhesion of Vulcanized Rubber to Metal (D 429). Cooperative test results so far obtained will be reviewed by the D-11 Subcommittee on Statistical Quality Control, particularly as regards the significance of the test results. Information regarding variables involved in the test will be studied. Items planned for revision include the thickness of the rubber section and the area of the test specimen.

A new bend test for friction materials bonded to metal will be voted on by the Subcommittee on Cements and Related Products for inclusion in the Tentative Methods of Testing Adhesives for Brake Lining and Other Friction Materials (D 1205). Consideration is being given to methods for testing wet film thickness.

The drop-ball method for impact resistance of hard rubber products is under study as an alternate impact test for inclusion in the Tentative Methods of Testing Hard Rubber Products (D 530). Use of the extensometer for determination of elongation of hard rubber is being investigated. Analytical procedures for determining soluble iron in hard rubber are being studied by several cooperating laboratories for possible inclusion in Methods D 530. Methods for determining failure in the hot-cold cycle for asphalt composition battery containers (D 639) is being further investigated. Results of acid absorption tests using the proposed new edge coating material indicate that a good seal of the cut edges of the specimens is being obtained. The task group will prepare a standard set of samples for further testing in various laboratories using the proposed test method and sealing material.

The Subcommittee on Coated Fabrics is enlarging its program of work as a result of increased interest in these materials. The personnel of the subcommittee is being enlarged to include representatives from other interested ASTM committees. The present test procedures in the Tentative Methods of Testing Rubber-Coated Fabrics (D 751) are considered satisfactory except that for the adhesion test. A questionnaire covering points requiring further study in connection with the adhesion test will be circulated in the subcommittee. While present ASTM pro-

cedures for light aging, oxygen bomb aging, oven and pressure heat aging, as applied to the testing of coated fabrics, are considered generally satisfactory, the subcommittee believes that a better means of evaluating the end point should be studied. It is also proposed that a test for cold cracking, plasticizer loss, and stiffness measurements of synthetic elastomers should be studied in cooperation with Committee D-20 on Plastics. Further work is needed on abrasion tests of coated fabrics using both the Stoll and the Schiefer machines. The abrasion methods prepared by Committee D-13 on Textile Materials will be reviewed in this connection. A test method for scrub testing of coated fabrics utilizing the equipment described in the R. T. Vanderbilt Co. Handbook is being investigated at the request of the committee on aeronautical fabrics of the Society of Automotive Engineers.

The Subcommittee on Low-Temperature Tests has appointed a task group to revise the Tentative Recommended Practice for Conditioning of Rubber and Plastic Materials for Low-Temperature Testing (D 832) as regards the temperature for maximum crystallization rate and to consider also the inclusion of construction details for a constant temperature liquid testing bath. Standard test temperatures of −55, −40, −25, −10, and +23 have been recommended for inclusion in this future revision. A proposed revision of the Tentative Method of Test for Low-Temperature Brittleness of Rubber and Rubber-Like Materials (D 736) to specify a standard exposure period of 5 hr in place of the 95-hr exposure period for natural rubber was recommended for committee letter ballot.

The Subcommittee on Standard Samples has considered reactivating its program for establishing the remainder of the standard compounded ingredients required to prepare the standard formulations now covered in the Tentative Methods of Samples Preparation for Physical Testing of Rubber Products (D 15). The suppliers of the various ingredients not yet standardized are being asked to donate the materials for this program. Favorable replies have been received from suppliers of conducting black, whiting and Silene EF, neoprene, and nitrile rubber. The National Bureau of Standards is proceeding with the necessary arrangements and test to set up standard lots of these materials.

Certain changes in standard formulations have been discussed including the following: (1) change the acetylene black used in electrically conducting natural rubber stock to a conducting furnace black such as Vulcan C, (2) change from neoprene GN to W or WRT, (3) change the GR-S recipes from 122 F to LTP type. The subcommittee will consider the addition of recipes loaded with HAF black based on both natural rubber and GR-S. The NBS has added a standard for testing work in the Government Synthetic Rubber Program a standard HAF black designated as standard sample No. 378.

The SAE-ASTM Technical Committee on Automotive Rubber has completed a revision of the SAW Specifications for V-Belts and Pulleys and also a Recommended Practice for V-Belt Drives. A revision of the Specifications for Automotive Rubber (D 735) has been approved, changing the elongation values for the 80 durometer stocks in Table I, Class R. A revision in Specifications D 735 replacing the suffix letter K (adhesion test required) to K_1 (adhesion test required, elastomer to metal bond made during vulcanization process), and K_2 (adhesion test required, cemented bond, made after vulcanization process), was approved and is now being referred to Committee D-11 and the SAE for appropriate action.

The SAE-ASTM Specifications for Non-metallic Gasket Materials for General Automotive and Aeronautical Purposes (D 1170) are to be further revised by the addition of six additional grades of gasket materials. The Section on Vibration Insulators has compiled the results of a round-robin study of tests for resilience and hysteresis made with the Yerzley oscillograph. The results varied appreciably and causes of these variations are now being studied. New specifications for power steering hose are being developed. Revisions in the Specifications for coolant hose and for hydraulic brake hose are under consideration. The Section on Hydraulic Brake Cups has prepared specifications for a master brake cylinder cup, also a change in the present cold test, and a corrosion test. Another section is studying revisions of the recently completed specifications for oil seals, published by the SAE. The Section on Finish Standards has reached the stage in its work where certain typical mold items are being selected, and the proposed finish specification will be applied to blueprints. The Section on Automotive Mats is considering specifying fadeometer and weathering tests for vinyl-coated mats, a means of measuring abrasion, methods of making a water spotting test, and a method for cleanability.

D-12 Soaps and Other Detergents

Subcommittee T-1 on Soap Analysis is continuing cooperative evaluation of a method for volumetric determination of copper in soap, using diethyl-dithiocarbamate reagent. A colorimetric method for determination of copper in soap has been completed and will be submitted for publication as tentative.

Subcommittee T-2 on Analysis of Synthetic Detergents has undertaken the development of a method for qualitative identification of synthetic detergents. Considerable progress has been made in the development of a reproducible method for obtaining infrared spectrograms of synthetic detergents.

Subcommittee T-3 on Analysis of Dry Cleaning Materials is developing methods for percentage of moisture, total nonvolatile matter, and flash point.

Subcommittee T-4 on Analysis of Alkaline Detergents is developing a method for analysis of tripolyphosphate.

Subcommittee T-5 on Physical Testing is compiling a bibliography of methods for measurment of the soil redeposition and plans to conduct cooperative testing of several such methods. A task group is working on the standardization of wetting test methods. Because of the importance of standardization of reflectance measurements in detergency testing, a task group has been established to study this problem. Studies are under way as the basis for development of methods for the measurement of the effect of brightening agents on textiles, resulting from the inclusion of such agents in detergent materials. Investigations of a proposed standard method for measurement of effectiveness of rewetting agents are being conducted.

Subcommittee T-6 on Analysis of Metal Cleaners has been working on metal cleaning methods as applied to the automotive industry. A guide to laboratory metal cleaning is being readied for publication. A method is under investigation for the evaluation of corrosion of vitreous enamel surfaces by detergents.

Subcommittee T-7 on Sampling and Interpretation of Data is assisting the other D-12 groups in the establishment of statistically controlled cooperative tests of proposed new and revised methods, and will survey all D-12 methods as to sampling techniques.

Subcommittee G-2 on Nomenclature and Definitions is attempting to formu-

late satisfactory definitions for recognized materials and processes in the detergent industry, for eventual incorporation in the Standard Definitions of Terms Relating to Soaps and Other Detergents (D 459).

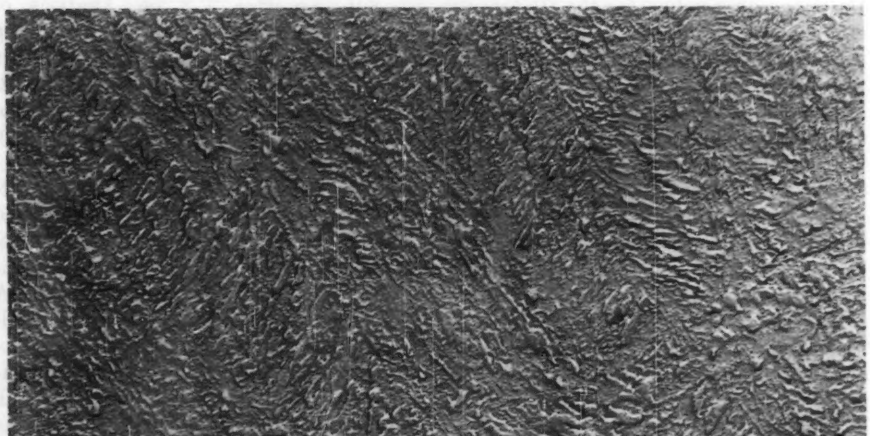
D-14 Adhesives

NEW procedures for testing the strength of adhesives by peel and strip tests are presently being considered. Redesigned tensile strength methods using a modified butt joint assembly is receiving considerable interest as a new method of test. Preliminary drafts of tensile, cleavage, and impact methods have been prepared and are also under consideration.

Information on adhesives for packaging purposes is being collected from various sources in an effort to prepare a new specification. Other information being collected for new specifications covers work in connection with wood-to-wood adhesives, label adhesives, and adhesives for acoustical tile. Experimental work is continuing on the reduction of length of test cycles for marine adhesives.

Refinement in the methods concerning the susceptibility of attack of adhesives by rodents and roaches is in prospect, although these proposed methods have as yet not been widely circulated.

A new compilation of standards on adhesives is being published this fall. This compilation will include not only the standard documents adopted by the Society but also several proposed methods, and standards from other committees which have a direct bearing on the adhesive field.



Electron Micrograph of Bainite Transformed at 500 F (× 35,000). Reduced for publication.

First prize, Electron Micrographs—Ferrous, Ninth ASTM Photographic Exhibit. F. O. Thomas and D. M. Teague, Chrysler Corp., Detroit, Mich.

D-15 Engine Antifreezes

PRELIMINARY work is under consideration for the determination of solids content in engine antifreezes. A laboratory collaborative testing program has also been arranged with seven industrial laboratories for the method of testing the effect of antifreeze on automotive rubber hose.

Another series of cooperative tests on a proposed method of effect of antifreeze on rubber hose is being undertaken in order to evaluate further the limitation of this method by the use of a greater number of antifreeze test samples from a large number of laboratories.

Twelve industrial laboratories using four different types of antifreezes and using tap water as a control have reported on the 336-hr beaker type corrosion test procedure. The procedure was found to be generally satisfactory in that it would differentiate between poorly inhibited and satisfactorily inhibited antifreeze solutions. These collaborative tests will provide information for the corrosion test procedure now in preparation.

D-16 Industrial Aromatic Hydrocarbons and Related Materials

CONSIDERABLE laboratory experimentation is providing information for the following test methods:

Refined naphthalene—methods of testing solidification point, acid wash color, and color.

Refined phenol—test methods for solidification point, water content, color, and water solubility.

Refined pyridine—test method for distillation range, water content, color, oil content, and permanganate reaction.

Refined quinoline—test method for distillation range, water content, oil content, and solidification point.

It is expected upon completion of these methods that specifications for these materials will also be prepared.

D-17 Naval Stores

AN extensive study of the conditions which induce rosin-acid crystallization is the subject of a new series

of experiments by cooperating laboratories. Collaborative analytical work is continuing on a separatory funnel method for determining unsaponifiable matter in rosin.

Progress is reported in the adaptation of the method of test for the softening point by ring-and-ball apparatus (E 28) for testing synthetic resins which cannot be tested in the usual manner. Modification in the design of the ring as well as improvements in the electrically heated bar type apparatus are being suggested for this purpose.

D-18 Soils for Engineering Purposes

The development of standards for the sampling of soils is being continued in Committee D-18 with three methods in mind, namely, auger sampling, split-spoon sampling, and Shelby tube sampling methods. The development of standard test methods to measure permeability will be pursued, following the recent presentation of a symposium on the subject, from which available data will be used. The development of a standard system of soils classification is making progress, and further review of classification systems described in the 1950 symposium, as well as other sources, will be made.

The standardization of such well-known test methods as the California Bearing Ratio and the Burggraf Shear Test is in progress, and further work will be continued. The moisture-density relationship of soils is also receiving attention for the purpose of developing a test method. Two test methods for determination of cement content, as alternates to the present method (D 806) are being considered. The development of a lateral-load test procedure for piles has been inaugurated, which will be similar to the vertical load test method covered by Method D 1143.

D-19 Industrial Water

With the objective of keeping the ASTM methods of test for industrial water fully up to date, Committee D-19 is completing work on revisions of the following twelve methods and expects to submit the new and revised procedures for publication within the coming year: Chloride Ion in Industrial Water (D 512), Orthophosphates in Industrial Water (D 515), Sulfate Ion in Industrial Water (D 516), Silica in Industrial Water (D 859), Dissolved Oxygen in Industrial Water (D 888), Acidity and Alkalinity in Industrial Water (D 1067), Iron in Industrial Water (D 1068), Fluoride Ion in Industrial Water (D 1179), Chemical Oxygen Demand (Dichromate Oxygen Demand) of Industrial Waste Water (D 1252), Nitrite Ion in Industrial Water (D 1254), Sulfides in Industrial Waste Water (D 1255), and Sulfite Ion in Industrial Water (D 1339).

An important revision, which will establish permissible limits for organic matter content, is planned for inclusion in the Specifications for Reagent Water (D 1193).

Other projects now under development in the committee include procedures for determination of the following: ammonia, copper, chromium compounds, organic carbon, phenolic compounds, biochemical oxygen demand, and optical properties (color, turbidity, etc.) of industrial water. Methods using the flame photometer and oxidation-reduction potentials are also being studied, with particular emphasis being placed on industrial water applications in the latter case. Sampling and gaging methods for industrial waste water are being developed, and round-robin tests of methods for analysis of water-formed deposits are being conducted.

D-21 Wax Polishes

Detailed experimental work is being carried out to study the flash point of viscous solvent-type waxes. This is necessitated by the unusual reaction given by such waxes in the common flash point testers now standardized by other ASTM committees. Also under study are methods of test for the melting points of hard vegetable waxes.

Considerable preliminary study is being given to defining what is to be considered shelf life and storage life for the formulation of methods to predicate these properties.

The study of a reliable secondary standard for the static and dynamic slip resistance test of floor wax is being continued.

D-23 Cellulose

A preliminary draft of the intrinsic viscosity method for cellulose derivatives has been completed. Work is now under way for these procedures and for preparing and standardizing the solvent and standardizing the viscometers to be used. A tentative procedure for cellulose extractives is being prepared and will be presented in the near future.

Experimental work regarding the effect of the strength of ethyl acetate used in solvent mixtures for viscosity determinations is nearing completion.

The selection of a procedure for determining the purity of sodium carboxymethyl cellulose has been made following an evaluation of several methods now in use. A task group was also activated to establish a method of analysis of hydroxyethyl cellulose.

Extensive surveys by this committee of methods used in commercial laboratories have been undertaken, and progress is reported on the methods for absorption and color of cellulose, ash constituents, molecular chain length, and alpha, beta, and gamma cellulose.

E-2 Emission Spectroscopy

A number of the suggested practices and methods published in the book of "Methods for Emission Spectrochemical Analysis" are now being prepared for publication as tentatives. It is expected that recommended practices for photographic photometry, for photographic processing, and for installation and safe operation of the spectrochemical laboratory probably will be submitted to the Society as proposed tentatives within the coming year. Methods for the spectrochemical analysis of lead, tin, aluminum, magnesium, zinc, iron, and steel all should soon be ready for publication as tentative.

Studies are being conducted for the purpose of developing methods of sampling for spectrochemical analysis. Methods for the analysis of electronic nickel are being developed in cooperation with Committee B-4 on Electrical Heating, Resistance, and Related Alloys. A new subcommittee will be established to work on methods for spectrochemical analysis of titanium, zirconium, and allied metals. Some twenty methods for analysis of nonmetallic materials are currently being considered for publication as suggested methods or as tentatives.

With growing interest in X-ray emission methods for analysis, the committee is establishing a task group to investigate methods of this type.

E-3 Chemical Analysis of Metals

As the result of recent intensive activity, the following new and revised methods for chemical analysis of metals will soon besubmitted to the Society for publication as tentative: chemical analysis of electronic nickel; chemical analysis of copper-beryllium alloys; chemical analysis of ferrotitanium; determination of magnesium in nodular iron and of manganese in steel; determination of silicon in ferrotungsten; determination of silicon in aluminum; and various revisions of the Tentative Photometric Methods for the Chemical Analysis of Lead, Tin, Antimony, and Their Alloys (E 87).

Also under development are the following new and revised methods: determination of aluminum, columbium, nickel, sulfur, tantalum, and zirconium in steels; analysis of fire-refined copper; analysis of chromium-copper alloys; analysis of silver-solder and other brazing filler metals; determination of zirconium in magnesium; analysis of high-chromium, high-nickel alloys; and determination of small amounts of antimony in various nonferrous alloys by the rhodamine-B method. Work on the above methods is being carried on intensively, and all or most of them should be ready for publication as tentative during 1955.

E-4 Metallography

THE Tentative Methods of Preparation of Metallographic Specimens (E 3T) are under revision, but the many advances in metallographic technique make this a major task. The committee has compiled for the past several years nearly 1000 terms relating to metallography and it is hoped to publish these in 1955.

Another major task is the proposed revision and expansion of the Tentative Recommended Practice for Identification of Crystalline Materials by the Hanawalt X-ray Diffraction Method (E 43). The American Crystallographic Assn. and the British Institute of Physics are participating in this work.

All the various grain size charts (E 19, E 79, E 89, E 91) are being thoroughly checked to eliminate any discrepancies, with a view toward consolidation in the future.

The studies on electron microstructure in Committee E-4 so far have been limited to steel. A major step has been taken by extending the work to include non-ferrous metals.

E-5 Fire Tests of Materials

A PROMINENT activity in Committee E-5 is the research program being conducted at the Forest Products Laboratories on the small tunnel test apparatus. Encouraging results have been obtained to date, and it is expected that much progress will be made during the coming year. The importance of this activity is emphasized by the interest of several of the ASTM technical committees concerned with particular fields of materials, who desire to have an ASTM standard test developed which can be used on acoustical and other types of interior finishes. Drafts of a proposed method for establishing the fire hazards of roof coverings will be given further consideration.

The problem of defining the term "noncombustible" still remains, with a proposed method for use in defining this term under review by the committee. Further revisions in the Standard Methods of Fire Tests of Building Construction and Materials (E 119) are under consideration, including a draft of a method using small size specimens, prepared originally by Committee E-6 on Methods of Testing Building Constructions for inclusion as an appendix to Method E 119. The expansion of the coverage of E 119 is also being studied to include steel joists and similar open-web members.

E-6 Methods of Testing Building Construction

THE inclusion of a racking test procedure for evaluation of sheet materials in the Tentative Methods of Conducting Strength Tests of Panels for Building Construction (E 72) will be considered by the committee. This procedure was developed by Committee C-16 on Thermal Insulating Materials and uses a standard framework to which sheet materials were attached. A draft of a proposed method of test for strength and stiffness of prefabricated floor and roof constructions is being reviewed. Problems of heat and water-vapor transmission through building constructions are being studied, initially by the evaluation of these properties for materials.

E-7 Non-Destructive Testing

IN final form and expected to be published very shortly is the proposed tentative method for dry powder magnetic particle inspection. The purpose of this method is to provide a uniform procedure which will produce satisfactory and consistent results upon which acceptance standards may be based.

After several years of development, it appears as though several documents dealing with the ultrasonic testing will be published shortly. These include specifications for standard reference blocks for ultrasonic testing, recommended practice for ultrasonic testing by reflection method using pulsed longitudinal waves introduced by direct contact, and a recommended practice for the resonance method of ultrasonic testing. Other projects include investigation of procedures for ultrasonic inspection of ferrous welds, for immersed ultrasonic inspection, and for ultrasonic inspection using angle projection of the beam through surface contact on the material.

Reference radiographs for steel welds are in their final stages. The publication of these radiographs has been delayed for several reasons, but the final result should be worth the delay.

E-9 Fatigue

A NEW Subcommittee V on Aircraft Structural Problems was formed in February, 1954. The purpose of this group is to attempt to present aircraft structural problems in such a form that the experience of Committee E-9, representing laboratories of government, university, and industrial types, can be drawn upon. Problems of spectrum loading, stress concentration effect, size effect, statistical interpretation, and biaxial stress are of the general kind now being considered by groups having widely different interests.

Supplementing its continuous interest in the sponsoring of numerous papers on the subject of fatigue at the annual meetings, Committee E-9 is planning for the 1955 Annual Meeting a symposium on size effect. Size effect, although recognized as an important factor in fatigue testing, has received relatively little attention, and this symposium should contribute appreciably to the knowledge of this subject.

E-10 Radioactive Isotopes

SINCE 1951, its organization year, Committee E-10 has been slowly gathering data on fields which seem fertile for standardization work. In 1953 a very successful symposium was held in Atlantic City. The papers presented have been printed and are now available in a special publication.

In 1954 the activities of the committee have crystallized. Six subcommittees are under organization covering: (1) isotopic application and methods, (2) health and safety, (3) radiation standards and counting techniques, (4) radioisotope gages, (5) tracer methodology, (6) analytical methods.

Army Laboratories Announce New Head

COLONEL H. F. Sykes, Jr., has assumed command of the main research center of the Corps of Engineers—the Engineer Research and Development Laboratories at Fort Belvoir, Va.

A graduate of West Point, Col. Sykes brings varied experience to his new command. He has served on the Munitions Board, Office, Secretary of Defense, and in the Office, Chief of Engineers.

Housekeeping for Defense

By Roger F. Hepenstal

Director, Cataloging, Standardization and Inspection, Department of Defense

Mr. Hepenstal, on leave from his position as Vice President of American Can Co., prepared the following report for the June issue of Taxpayer's Dollar, a publication of the United States Chamber of Commerce, to whom we are indebted for permission to reprint this timely article.

The Assistant Secretary of Defense (Supply and Logistics) is responsible for carrying out the mandate of Public Law 436, 82nd Congress, to establish within the Department of Defense a single catalog system, the standardization of supplies, and the more efficient use of procurement inspection facilities and services. This is a brief report on recent developments in these programs.

Cataloging

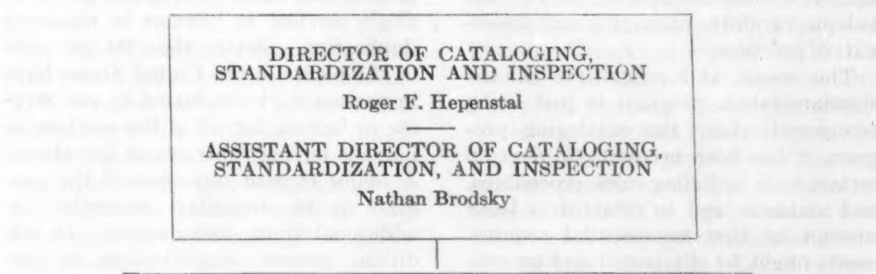
Cataloging has been performed in the military services in one form or another for many years. The difficulties in managing the vast stocks of materials during World War II emphasized the need for improving supply practices. To accomplish this, it appeared to The Congress that a single uniform identification supply language was essential. Thus the Federal cataloging program was initiated in 1949. As time went on, The Congress became impatient with the progress of the program and in July, 1952, passed Public Law 436 directing the Department of Defense to assume complete responsibility for the catalog program in the military departments and to press vigorously for its completion.

At the present time there are fourteen different major logistics systems in the Department of Defense. To a great extent each of these systems names, describes, and numbers its items of supply independently of the others, even though the systems may stock identical items. To attempt to connect the pipelines of these various systems for supply management purposes is obviously a complicated problem. One of the basic tools for accomplishing this is through the use of a uniform catalog system. This catalog system is designed to provide a single name, a single description, and a single stock number for each item of supply which is repetitively procured and stocked.

The catalog identification work is being performed by the Army, the Navy, and the Air Force in their twenty-four major cataloging locations. The Office of the Secretary of Defense is exercising policy guidance and program control. It is estimated that there are approximately 4,000,000 items being handled today in the various military logistics systems. Great quantities of new items are being added to the systems daily and others are becoming obsolete and are being discarded through normal disposal. By eliminating the known duplicates and by research and consolidation, it is believed that the 4,000,000 items will be reduced to about 2,000,000 when the current catalog identification program is completed.

The cataloging program is a pioneering effort on a scale never before undertaken by either Government or industry. Its impact upon the military supply systems is tremendous and those who are charged with administering the program must be sure that they do not impair the supply potential of our armed services during the transition period to the use of the new system. Very little, if any, recognition has been given to the tremendous complexities involved and to the necessity for establishing fundamental tools upon which a sound cataloging program could be based. These tools, the policies, rules, procedures, manuals forms, etc., have now been developed and are in use. As of the end of 1952 the Department of Defense had named, described, classified, and stock numbered 530,000 items or about 26 per cent of the estimated net total of 2,000,000 that will be identified. By the end of June, 1954, it is expected that the identification program will be 41 per cent completed.

As the identifying or cataloging phase is accomplished, we move into the conversion phase which consists of the change within the military services from the various identification and number-



Organizational Chart of the Cataloging, Standardization and Inspection Office of the Defense Department.

ng systems now in use to the single uniform language and stock numbers provided by the new program. Conversion involves the change of millions of records throughout the United States and our world-wide defense operations. It requires changing item identification tags, remarking bins, remarking containers, and revising stock locator records. In some cases, it may require actual physical rewarehousing. It is undoubtedly the greatest single task ever attempted in the military logistics systems. The entire military establishment has already converted to the use of the single identification language in all food items. By the end of June, 1954, conversion shall have been completed on all clothing, medical and fuel and lubricant items. Realistic schedules for completion of cataloging and conversion in all areas have been established. Moreover, for the first time in the history of the catalog program, management tools are available which permit the identification of bottlenecks, the realistic scheduling of the program, and evaluation of progress.

Standardization

We believe that the standardization of supplies is a fertile field for greater efficiency and economy and we are taking steps to provide increased impetus to this program. The fundamental objectives of the defense standardization program are twofold: first, to increase the combat effectiveness of our military forces, and second, to conserve materials, resources, production facilities, money, manpower, and time. The program for achieving these objectives centers around the following: (1) reducing the number of sizes, kinds, and types of items in the military supply systems; (2) increasing the interchangeability of component parts; and (3) developing uniform packaging and preservation practices.

The scope and magnitude of the standardization program is just being recognized. Like the cataloging program, it has been necessary to develop certain tools including rules, procedures, and manuals, and to establish a basic concept so that nonessential requirements might be eliminated and an economical minimum of kinds, types, and sizes of items established.

The standardization program is being reoriented toward the increasing use of standard commercial products wherever a supply support problem is not created. The indiscriminate use of technical commercial products could result in increased need for a variety of spare parts to support these items. This is not only uneconomical in the long run but is detrimental to military efficiency as well. It is recognized that special military specifications which require retooling or other production line adjustments are not only more expensive but, in many cases, may not be justified in terms of actual need. The Department of Defense hopes to develop means for accepting more standard commercial products wherever possible. In the meantime, increasing emphasis is being placed on incorporating industrial and technical (society) standards into the military systems.

Considerable progress has been made in eliminating duplicate specifications among the military services. There has been increasing collaboration with industry in establishing standards and in modernizing Government specifications. As an example, all Government specifications for steel are being reviewed with the steel industry in order to eliminate unnecessary varieties and to align them with current industry practices. Deliberate efforts are being made to interest all industries in the standardization program and to consult with them regularly.

The benefits from standardization manifest themselves not only in facilitated production but also in reduced procurement, distribution, and maintenance costs as well as in improved military support. An effective standardization program will not only insure quality production but will also facilitate the maintenance of the products at minimum costs. When sufficient time has elapsed to permit the standardization program to reach its full stature, we believe that significant savings will accrue therefrom.

Procurement Inspection

In the field of procurement inspection, significant progress has been made in assigning inspection in the plants to single services or bureaus to eliminate duplication. Better than 90 per cent of the plants in the United States have inspection work conducted by one service or bureau for all of the services or bureaus having contracts at the plants. A major current objective of the program is to streamline inspection by additional single assignments. In addition, greater simplification in the Department of Defense inspection is anticipated from a policy which places greater reliance on the adequacy of contractors' inspections and more extensive use of destination inspection on small orders.

Increasing emphasis is being placed upon the development of uniform inspection practices. These uniform practices, coupled with the quality assurance concept which places greater responsibility upon the contractor, should not only provide a better product to the military services but should also result in improved relationship with industry.

Conclusion

Significant strides forward are being made in the cataloging, standardization, and procurement inspection programs of the Department of Defense. None of these areas has a wide fund of experience, or resources to draw upon and each requires careful study, planning, and preparation before tangible results manifest themselves. The best talents available in the country are devoted to solving the intricacies of these complex areas for we believe that they are basic tools toward attaining sound economy in military supply as well as in improving the supply support of our military forces.

Third Symposium on Temperature

An international Symposium on Temperature—Its Concept and Measurement—will be held at Washington, D.C., Oct. 28–30, 1954, under the joint sponsorship of the American Institute of Physics, the National Bureau of Standards, and the Office of Ordnance Research (U. S. Army).

The program will include discussions of the concept of temperature in unusual systems, such as very hot gases and matter near absolute zero, as well as experimental methods of measuring these extreme temperatures. In addition, consideration will be given to the temperature scales and standards in use at the present time and the effects of recent changes in the definitions of these scales. Emphasis will be placed on the basic physics of temperature concepts and measurements.

This will be the third temperature symposium in a series which began in 1919 and was continued in 1939. The collected papers will be published in book form, as was done for the 1939 symposium, in order to provide a comprehensive, authoritative reference work in the field. Over-all guidance of the symposium is being furnished by a committee composed of A. V. Astin (chairman), J. A. Beattie, F. G. Brickwedde, W. O. Davis, Jr., I. Estermann, K. F. Herzfeld, T. J. Killian, P. E. Klopsteg, J. E. Mayer, Wallace Waterfall, and Alfred Weissler (secretary).

Further information may be obtained from Mr. Waterfall, American Institute of Physics, 57 E. 55 St., New York 22, N. Y.

NEW ASTM PUBLICATIONS

Symposium on Temperature Stability of Electrical Insulating Materials a Significant and Valuable Publication

THE Symposium on Temperature Stability of Electrical Insulating Materials, held at the ASTM 1954 Annual Meeting, in Chicago, has just been published, bringing to the fore the work of many researchers in the field of accelerated laboratory-aging tests in an effort to produce standard methods for predicating thermal stability of electrical insulating materials.

In "The Measurement of Dielectric Properties at Temperatures up to 500 C," A. H. Scott, P. Ehrlich, and J. F. Richardson, of the National Bureau of Standards describe a holder which could subject the dielectric specimens to a temperature range of 20 to 500 C, and to a frequency range of 10^2 to 10^7 cps. This apparatus permitted measurement of the dielectric constant, dissipation factor, and the thermal expansion of the specimens.

In his paper, "The Dielectric Measurement on Plastics at High Temperatures," Thomas Hazen, Bakelite Corp., presents graphic data illustrating the dielectric behavior of phenolics, silicones, polyesters, epoxy resins, and polymonochlorotrifluoroethylene, at elevated temperatures in the range from 23 to 200 C.

His work includes the electrical properties of phenolic-glass laminates, silicone laminates, and molding materials at relatively long exposures to high temperatures. Because of the lack of standard test methods for determining the electrical properties of bonded mica splittings, a test method for the determination of the volume and surface resistivities was developed by K. Wechsler, Mica Insulator Co., and is described in "The Electrical Resistivity of Bonded Micaceous Materials at Elevated Temperatures."

Development of high heat-resistant varnishes has accelerated the study of new test methods for evaluating the effect of heat aging on the electrical and physical properties of varnish films. The purpose of the paper, "Test Methods for Studying Thermal Stability and Heat Aging of Electrical Insulating Varnishes," by A. H. Haroldson, Continental-Diamond Fibre Co., is to review the various test methods that have been used for studying heat aging of electrical insulating varnishes and to present data on heat-aging experiments conducted for further study to develop new test methods of evaluation of the thermal stability of insulating varnishes. The results of the present test methods for evaluating the effect of heat aging on the properties of varnish films do not duplicate service conditions. The tests have proved useful only for control and classification purposes.

"Thermal Stability of Insulating Fabrics," by R. C. Bartlett, Natvar Corp., presents information resulting from a survey by the members of Subcommittee VII on Insulating Fabrics of ASTM Committee D-9 on Electrical Insulating Materials. Suggestions and test data on the thermal stability of electrical insulating materials have been collected in order to present a composite point of view on thermal stability. This presentation includes several new test methods which are described for future consideration in ASTM activities.

"Thermal Stability of Polyvinyl Chloride Insulating Compounds," by R. C. Bartlett, Natvar Corp., defines a new test method for evaluating the thermal stability of flexible polyvinyl chloride insulation and presents test data derived from the method. By interpretation of the mechanical test results an index of the thermal stability for any given polyvinyl chloride compound can be obtained. This index can be employed to make predictions of the useful mechanical life of such insulation up to periods of 25 years.

In "The Deflected Beam Film Rupture Test Applied to Sheet Insulation," K. N. Mathes and H. I. Morgan, General Electric Co., discuss the application of the deflected beam film rupture technique for the determination of the heat resistance of sheet and tape insulation such as is used in motor and generator insulation.

The test procedure is developed to measure the elongation of the surface of the sample in transverse bending required to cause cracking or discontinuity as indicated by electrical failure. A comparison of varnished cloth with synthetic sheet insulation is made.

"Heat Aging Characteristics of Insulating Varnishes," by H. I. Morgan and K. N. Mathes, General Electric Co., describes the use of the deflected beam film rupture test for evaluating the heat resistance of magnet wire insulation with different types of insulating varnish. The degree of elongation of the surface to cause cracking or discontinuity as indicated by electrical failure is measured. This technique is proposed as a functional test method for determining the temperature classifications of insulating varnishes when used as impregnates for magnet wire and similar insulation structures.

"A Method for Evaluation of the Thermal Aging Stability of Flexible Sheet Insulation," by C. G. Currin and R. M. Plettner, Dow Corning Corp., describes a method using the dielectric strength of the insulation as the failure criterion. This method has been designed for functional and statistical accuracy, simplicity, and economy of time, labor, materials and equipment.

By testing at several temperatures, the life temperature relationship is established over a temperature range. This relationship is the goal of the test and from it the lower temperatures may be predicted.

"Effect of Elevated Temperature on Silicone Varnished Glass Fabric for Electrical Insulation," by O. E. Anderson, Continental-Diamond Fibre Co., is confined to tests on silicone varnished glass fabric showing how it is affected by elevated temperatures. It also describes various other tests including the ASTM Methods of Testing Varnished Glass Fabrics and Varnished Glass Fabric Tapes Used for Electrical Insulation (D 902).

Following these descriptions a review of the merits of each test is made. The results of this work are clearly simplified by the acceptance of the ASTM standard method for many material specifications and standards for electrical insulating materials.

In addition to the papers presented at the Annual Meeting the "Electrical Properties of Thermosetting Plastics at Elevated Temperatures" by R. R. Winans and W. Hand is also included. This paper discusses the development of special equipment and procedures for the study of electrical properties of thermosetting plastic materials at elevated temperatures. The equipment is used for elevated temperature measurements of dielectric strength, dielectric constant, electrical loss, and electrical resistance. The effects of long- and short-time exposures on the foregoing properties of several laminated materials are given. The work is primarily directed toward short-time temperature exposure tests, which will give valid indications of electrical insulation life.

Copies can be obtained from ASTM Headquarters, 1916 Race St., Philadelphia. Price: \$2.75; to members, \$2.

ASTM Standards on Copper and Copper Alloys

THE latest compilation of ASTM Standards Relating to Copper and Copper Alloys, sponsored by Committee B-5 is now available. It offers in convenient reference form 123 specifications and tests, covering copper, copper-alloy, and copper-covered steel electrical conductors (developed by Committee B-1 on Wires for Electrical Conductors); plate, sheet, strip, and rolled bar; rod, bar and shapes, and die forgings; wire; pipe and tube; ingot; castings; filler metal. Also included are specifications written by Committee B-2 on Non-Ferrous Metals and Alloys covering the primary forms of copper, zinc, lead, and nickel that are used in the manufacture of the products dealt with in the Committee B-1 and Committee B-5 specifications.

In appendices are presented the regulations governing Committee B-5 and a listing of its personnel and its representatives on other committees. This compilation may be had in both heavy paper cover and cloth covers. The prices for paper-cover editions are $5; to members, $3.75. For the cloth-bound edition add 65 cents to these prices. Copies can be obtained from ASTM Headquarters, 1916 Race St., Philadelphia 3, Pa.

• • •

ASTM Standards on Bituminous Materials for Highway Construction, Waterproofing, and Roofing

SPONSORED jointly by ASTM Committee D-4 on Road and Paving Materials and Committee D-8 on Bituminous Waterproofing and Roofing Materials, this compilation brings together in convenient reference format all the ASTM tests and specifications pertaining to bituminous materials used in highway construction and in waterproofing and roofing.

Also included are standards covering creosote materials developed by Committee D-7 on Wood but pertinent to the highway construction field; ASTM specifications for thermometers; and specifications for testing sieves.

This 450-page publication containing 138 standards is bound in heavy paper cover and may be obtained from ASTM Headquarters, 1916 Race St., Philadelphia 3, Pa. Price: $4; to members, $3.

Symposium on Effect of Temperature on the Brittle Behavior of Metals with Particular Reference to Low Temperatures

VERY little of the wealth of data accumulated on the subject of metals performance at low temperatures has been fully evaluated and incorporated into the commonly used handbooks. Consequently the Low Temperature Panel of the ASTM-ASME Joint Committee on Effect of Temperature has endeavored in this symposium to bring together and summarize the present state of knowledge of the subject in an effort to make designers and engineers more cognizant of the joint role played by metallurgical and mechanical factors in their influence on the behavior of metals at low temperatures and particularly of the variable response to variations in stress systems, strain rates, and size effects.

In this symposium the treatment of structural carbon steel receives more attention than other metals because of its extensive application but other metals are also included in the presentation.

Following an Introduction by A. L. Tarr, vice-chairman of the Low Temperature Panel, the following papers appear, together with discussions:

Brittle Failures in Ships and Other Steel Structures—K. K. Cowart
Analysis of Brittle Behavior in Ship Plates—M. L. Williams
A Critical Survey of Brittle Fracture of Carbon Plate Steel Structures Other than Ships—M. E. Shank
Interest of the Army in Brittle Failures—T. T. Paul
Theory of Brittle Fracture and Criteria for Behavior at Low Temperatures—E. R. Parker
Brittle Fracture: Significance for Engineers—S. L. Hoyt
Metallurgical Aspects of Low-Temperature Behavior in Ferrous Materials—C. H. Lorig
Fundamentals of Fracture in Metals—M. Gensamer
The Effect of Size upon Fracturing—G. R. Irwin
Brittleness, Triaxiality, and Localization—W. R. Roop
Effect of Metallurgical Structure on the Impact Properties of Steels—J. A. Rinebolt
Evaluation of the Significance of Charpy Tests—W. S. Pellini
Significance of V-Notched Impact Test in Evaluation of Armor Plate—A. Hurlich
Notch Bend Tests for Evaluating the Properties of Weldments—R. D. Stout
Reproducibility of Keyhole Charpy and Tear-Test Data on Laboratory Heats of Semikilled Steels—R. H. Frazier, J. W. Spretnak, and F. W. Boulger
Effect of Specimen Preparation on Notch-Toughness Behavior of Keyhole Charpy Specimens in the Transition Temperature Zone—R. W. Vanderbeck, W. T. Lankford, S. C. Synder, R. W. Lindsay, and H. D. Wilde
Low Temperature Impact Properties on Titanium—D. E. Driscoll
Effect of Boron on the Impact Properties of Quenched and Tempered Steels—H. Schwartzbart and J. P. Sheehan
The Notched Bar Impact Properties of Tempered Martensite in Medium Carbon, Medium Alloy Grades of Steel—M. Baeyertz, W. F. Craig, and J. P. Sheehan
Notch Sensitivity of Steels—E. J. Ripling
Effect of Carbon and Nitrogen on the Tensile Deformation of High-Purity Iron at at 27 C and at −196 C—L. D. Hall
Tension Impact Strength and Strain Distribution at Room and Sub-Zero Temperatures of Stainless and Other Steels—G. R. Mayne, V. N. Krivobok, and C. W. Muhlenbruch
Low Temperature Toughness of Flake and Spheroidal Graphite Cast Irons—J. S. Vanick
Ductile and Brittle Failure in Ferritic Nodular Iron—G. N. J. Gilbert
The Low Temperature Properties of Cast Iron—G. N. J. Gilbert
Impact Properties of Ferritic Ductile Iron—R. W. Kraft

Copies of this 450-page symposium can be obtained from ASTM Headquarters, 1916 Race St., Philadelphia 3, Pa. Price: $7.50; to members, $5.65.

• • •

Manual of Industrial Water

THIS Manual, now in its second printing, offers a broad discussion on the nature and uses of industrial water, plus up-to-date methods and specifications developed by leading authorities in the field. While this general discussion, comprising the first eight chapters, is essentially identical to the first printing, 14 new methods, many revisions of existing methods, a complete table of contents, and a detailed index have been incorporated into the Manual. Demand for the first printing was so great that the Society's stock was completely exhausted in a short time. In order to meet this constant demand it has been necessary to publish a second printing, since a new edition, now under study, is still some distance in the future.

Several years of collaborative work by leading water authorities have now gone into this Manual which, more specifically, is intended as an authoritative reference source of information for three types of users: executives and plant designers; individuals engaged in industrial operations involving the use of water; and analysts, operators of special instruments, engineers, and consultants. It provides basic information for routine use and gives direction into the technical literature, thus serving as a point of departure for more specific and detailed studies. The several chapters included cover: Uses of Industrial Water, Diffi-

culties Caused by Water in Industry, Composition of Industrial Water and Water-Formed Deposits, Treatment of Industrial Water, Sampling, Analysis, and Sampling and Identification of Water-Formed Deposits. Also included in this Manual are the various Definitions of Terms (revised), Sampling Methods, Analytical Methods, Corrosivity Tests, Methods of Reporting and General Testing Methods, which in the past have comprised the compilation of Standards on Water. Committee D-19. 420 pages. (September, 1954.) Cloth cover, $5; to ASTM members, $3.75.

Copper Strip Corrosion Standards for Petroleum

Studies have been under way for several years to provide adequate reference standards for use with ASTM Method of Test for Free and Corrosive Sulfur in Petroleum Products (D 130). A polished copper strip is immersed in the sample (automotive gasoline, aircraft fuels, tractor fuel, cleaners, diesel fuel, and fuel oil), then heated and, after washing, is compared with standard reference strips. These visual standards ASTM now has available, fabricated by an approved process, inspected by an approval committee, and encased in plastic to insure reasonable permanence.

The actual corrosion comparison standards, 13 various colored strips, prepared by Central Scientific Co. and produced by a photolithographic process on aluminum, are arranged according to increasing severity of attack.

It is not possible at this stage to state how long the colors will remain permanent, although every effort has been made to insure reasonable longevity. A set of standards comes in a plastic case which includes instructions for use with a copy of current Method D 130, and can be obtained from ASTM Headquarters, 1916 Race St., Philadelphia 3, Pa. Price: $25, shipping charges included.

Erratum

The photographs by A. Loro entitled "Luders Markings on Aluminum-Magnesium Alloy" as published in the July, 1954, Bulletin should have had the following credit line: "Courtesy Sheet Metal Industries."

High-Temperature Properties of Super Strength Alloys Summarized Graphically

The Report on the Elevated Temperature Properties of Selected Super Strength Alloys, the third in a series of reports prepared under the auspices of the Data and Publications Panel of the ASTM-ASME Joint Committee on Effect of Temperature on the Properties of Metals is primarily a graphical summary of the elevated temperature strength data for the following 13 selected super-strength alloys: 19-9 DL, 16-25-6, Discaloy 24, A-286, N-155, S-590, S-816, Haynes Alloy No. 25, Refractaloy 26, Inconel "X," M-252, Haynes Alloy No. 21, Haynes Alloy No. 31.

Included are summary curves for tensile strength; 0.2 per cent offset yield strength; per cent elongation and reduction of area; stresses for rupture in 100, 1000, 10,000, and 100,000 hr when available; and stresses for creep rates of 0.0001 and 0.00001 per cent per hr (1 per cent in 10,000 and 100,000 hr). Also included are brief descriptions of each alloy giving chemical composition and recommended heat treatments and processing.

Compared to the two previous survey reports, in this report the format has been changed slightly. The original data sheets appear in the body of the report directly following the curves, instead of in an appendix. This change has been made to encourage reference to the data sheets when using the plotted data.

Two appendices are included. Appendix I contains very-short-time data for several of the alloys covered by this report. These data are useful in the design of supersonic vehicles and rocket motors. Appendix II includes as complete a list as possible of the known "super alloys" although many of these alloys are not commercially available. This compilation, with approximate chemical compositions, was made available through the courtesy of Subcommittee XII on Specifications for High-Temperature Super-Strength Alloys of ASTM Committee A-10 on Iron-Chromium, Iron-Chromium-Nickel, and Related Alloys.

This report (paper cover only) of more than 200 pages, is available from ASTM Headquarters, 1916 Race St., Philadelphia 3, Pa. Price: $4.75; to members, $3.50.

• • •

1954 ASTM Year Book

Soon to go into the mails is the 1954 edition of the Society's Year Book, a comprehensive reference work of ASTM members and fields of activity.

The 600-page Year Book provides an alphabetical listing of members with addresses, title, and company affiliations; and in the case of company memberships, the name of the company representative. As a further useful service, it also contains a geographical listing of the members in this country and throughout the world.

Technical committees of the Society are given with their complete personnel—officers and members of the main committees and their subcommittees.

Rounding out its function as a complete handbook of the Society, the Year Book includes, Charter, By-laws, and regulations; lists of past officers, lecturers and award winners; personnel of the administrative committees; and officers and councilors of the ASTM Districts.

The Year Book is distributed to members *on request.* Copies are given to new members who subsequently may request that their names be added to the permanent mailing list.

Costs of producing such a comprehensive publication have climbed rapidly and it is hoped that those who have no need for the Year Book will not request a copy or will have their names removed from the mailing list.

The Year Book is not available for general distribution. It is published only for the use of the members in connection with Society activities.

Norelco Fall Diffraction School Shifted to Chicago

The Fall sessions of the Norelco X-ray Diffraction School which have been held for the past eight years in the New York area, are scheduled this year at the Knickerbocker Hotel, Chicago, during the week of Oct. 25–29.

Morning sessions of the school will be devoted to lectures, and afternoon meetings will involve laboratory demonstrations using latest types of equipment. This work will cover powder camera, X-ray Diffractometer (Diffraction Goniometer), and X-ray Spectograph (Fluorescence Analysis) techniques.

The last session will be devoted to actual application problems from the field.

No registration fee will be charged. Those who wish to attend should register as soon as possible.

ASTM Bulletin

SEPTEMBER 1954

NO. 200

NINETEEN-SIXTEEN
RACE STREET
PHILADELPHIA 3, PENNA.

Officers and Members of Board of Directors and Committees of the Board

SUBSEQUENT to the June election of five new members to the Board of Directors of the Society, the Executive Committee of the Board and the other Board Committees provided for under the By-Laws, were reorganized.

The personnel of the new Executive Committee which will function during 1953–1954, and of the other seven subcommittees appears below.

President:

N. L. MOCHEL, Manager, Metallurgical Engineering, Westinghouse Electric Corp., Lester Branch P.O., Philadelphia 13, Pa.

Vice-Presidents:

C. H. FELLOWS, Director, Engineering Lab. and Research Dept., The Detroit Edison Co., 2000 Second Ave., Detroit 26, Mich.

R. A. SCHATZEL, Vice-President and Director of Engineering, Rome Cable Corp., 421 Ridge St., Rome, N. Y.

Directors:

(*Term Expiring in 1955*)

G. R. GOHN, Supervisor, Creep and Fatigue Labs., Bell Telephone Laboratories, Inc., 463 West St., New York 14, N. Y.

W. H. LUTZ, Vice-President, Pratt & Lambert, Inc., 79 Tonawanda St., Buffalo 7, N. Y.

H. K. NASON, Research Director, Organic Chemicals Div., Monsanto Chemical Co., 800 N. 12th Blvd., St. Louis 1, Mo.

A. O. SCHAEFER, Vice-President, Executive Assistant, The Midvale Co., Nicetown, Philadelphia 40, Pa.

M. A. SWAYZE, Director of Research, Lone Star Cement Corp., 15th Floor, 100 Park Ave., New York 17, N. Y.

(*Term Expiring in 1956*)

N. A. FOWLER, Director of Sales and Research, General Box Co., 1825 Miner St., Des Plaines, Ill.

R. T. KROPF, Vice-President and Director of Research, Belding Heminway Co., 1407 Broadway, New York 18, N. Y.

T. F. OLT, Director, Research Labs., Armco Steel Corp., Middletown, Ohio.

J. R. TOWNSEND, Director, Material and Standards Engineering, Sandia Corp., Sandia Base, Albuquerque, N. M.

K. B. WOODS, Head, School of Civil Engineering and Engineering Mechanics, and Director, Joint Highway Research Project, Purdue University, Civil Engineering Bldg., Lafayette, Ind.

(*Term Expiring in 1957*)

E. J. ALBERT, President and Treasurer, Thwing-Albert Instrument Co., Penn St. and Pulaski Ave., Philadelphia 44, Pa.

J. M. CAMPBELL, Administrative Director, Research Laboratories Div., General Motors Corp., Box 188 North End Station, Detroit 2, Mich.

P. V. GARIN, Engineer of Tests, Southern Pacific Co., 65 Market St., San Francisco 5, Calif.

J. H. JENKINS, Chief, Canada Forest Products Labs., Pretoria & Metcalfe Sts., Ottawa, Canada.

D. E. PARSONS, Chief, Building Technology Div., National Bureau of Standards, Washington 25, D. C.

Past-Presidents:

T. S. FULLER, Consultant, 2131 Grand Blvd., Schenectady 9, N. Y.

H. L. MAXWELL, Special Assistant to Management, E. I. du Pont de Nemours and Co., Inc., 1350 Louviers Bldg., Wilmington 98, Del.

L. C. BEARD, JR., Assistant Director, Socony-Vacuum Labs., Socony-Vacuum Oil Co., Inc., 26 Broadway, New York 4, N. Y.

Committees of Board of Directors

Executive Committee

C. H. Fellows, *Chairman*

E. J. Albert — N. L. Mochel
L. C. Beard, Jr. — A. O. Schaefer
K. B. Woods

Finance Committee

T. S. Fuller, *Chairman*

L. C. Beard, Jr. — H. L. Maxwell
R. T. Kropf — R. A. Schatzel

Membership Committee

A. O. Schaefer, *Chairman*

C. H. Fellows — P. V. Garin
N. A. Fowler — G. R. Gohn

Developmental Activities

R. T. Kropf, *Chairman*

J. M. Campbell — T. F. Olt
J. H. Jenkins — A. O. Schaefer

Meetings and Programs

N. A. Fowler, *Chairman*

E. J. Albert — H. K. Nason
J. H. Jenkins — M. A. Swayze

Technical Committee Activities

T. F. Olt, *Chairman*

J. M. Campbell — H. K. Nason
W. H. Lutz — D. E. Parsons

Inter-Society Relations

K. B. Woods, *Chairman*

E. J. Albert — D. E. Parsons
G. R. Gohn — J. R. Townsend

Lectures and Awards

W. H. Lutz, *Chairman*

P. V. Garin — M. A. Swayze
G. R. Gohn — K. B. Woods

President Mochel is an *ex-officio* member of all Board Committees.

Standards Voted on in Letter Ballot

DURING early August a letter ballot went out to the members for approval of proposals from the technical committees on standards and tentatives. These proposals fell into two categories: (1) the adoption of tentative specifications and tests as formal standards, and (2) the adoption of revisions in existing standards. The letter ballot was being canvassed as this issue went to press and results will be reported in the October issue.

In connection with actions on standards, it should be noted that only by letter ballot of the entire Society membership can changes be made in the *formal* standards. Actions taken in an Annual Meeting session alone, or in the interval between Annual Meetings, by the Administrative Committee on Standards can (1) approve for publication as *tentative* proposed new standards, (2) approve *revisions in tentative standards* (which are incorporated immediately), or (3) take action to permit publication of *proposed revisions in standards as tentative.*

Detailed information concerning matters referred to letter ballot is given in the committee reports preprinted for the Annual Meeting. The Summary of Proceedings which accompanied the letter ballot contains a record of all actions taken at the Annual Meeting.

NOTICE

THERE was an inadvertent omission of items in the 1954 Letter Ballot on Recommendations Affecting ASTM Standards. In order to present these items to the membership of the Society the following special letter ballot is included in this issue of the ASTM BULLETIN. All members are urged to complete this ballot, detach, and return it to ASTM Headquarters by October 15, 1954.

ASTM
1916 Race Street
Philadelphia 3, Pa.

1954 Letter Ballot
Revision of Existing Standards

	Affirmative	*Negative*	*Not Voting*
Gypsum (see Report of Committee C-11)			
211. Methods of Testing Gypsum and Gypsum Products (C 26 – 52)........	______	______	______
212. Spec. for Gypsum Partition Tile or Block (C 52 – 41)........	______	______	______
213. Spec. for Gypsum Sheathing Board (C 79 – 52)..	______	______	______
214. Spec. for Gypsum Lath (C 37 – 50)........	______	______	______
Methods of Testing (see Report of Committee E-1)			
215. Test for Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials (E 18 – 42)	______	______	______

(Signed)______________________________
Member, ASTM

Date______________

Schedule of ASTM Meetings

This gives the latest information available at ASTM Headquarters. Direct mail notices of all district and committee meetings customarily distributed by the officers of the respective groups should be the final source of information on dates and location of meetings. This schedule does not attempt to list all meetings of smaller sections and subgroups.

DATE	GROUP	PLACE
Oct. 3–7	Committee D-2 on Petroleum Products and Lubricants	Washington, D. C. (Sheraton Park Hotel)
Oct. 4–5	Committee C-9 on Concrete and Concrete Aggregates	Jackson, Miss. (Waterways Experiment Station)
Oct. 4–6	Committee C-16 on Thermal Insulating Materials	Shawnee on Delaware, Pa.
Oct. 5–6	Committee B-5 on Copper and Copper Alloys, Cast and Wrought	Washington, D. C. (Sheraton Park Hotel)
Oct. 6–7	Joint Committee on Petroleum Wax	Dayton, Ohio (Hotel Biltmore)
Oct. 7	Committee C-14 on Glass and Glass Products	Pittsburgh, Pa.
Oct. 7	ASTM Ohio Valley District-TAPPI Joint Meeting	Dayton, Ohio
Oct. 7–8	Committee C-1 on Cement	Jackson, Miss. (Waterways Experiment Station)
Oct. 13	Philadelphia District	Philadelphia, Pa. (Drexel Institute)
Oct. 15	New York District	New York, N. Y. (Engineering Societies Building)
Oct. 19–20	Committee C-22 on Porcelain Enamel	Columbus, Ohio
Oct. 19–20	Committee C-19 on Structural Sandwich Constructions	Lafayette, Ind. (Purdue University)
Oct. 19–22	Committee D-13 on Textile Materials	Washington, D. C. (Sheraton Park Hotel)
Oct. 25–26	Committee B-1 on Wires for Electrical Conductors	Washington, D. C. (Sheraton Park Hotel)
Nov. 15–17	Committee D-20 on Plastics	Cleveland, Ohio (Carter Hotel)
Nov. 17–19	Committee D-9 on Electrical Insulating Materials	Cleveland, Ohio (Carter Hotel)

Van Atta Appointed Assistant Secretary

AT THE May 11 meeting of the Board of Directors Fred F. Van Atta of the ASTM Staff was named Assistant Secretary.

Mr. Van Atta, who joined the Staff last September, will expand his duties and responsibilities in the coordination and extension of developmental and promotional activities including sales, membership, advertising, exhibits, etc. He will also handle special administrative assignments.

A graduate of Michigan State College, the new Assistant Secretary has had a variety of engineering and related experience. Before coming to ASTM he had been Manager, Building Division, Carolinas Branch Associated General Contractors, and prior to that, acting Secretary-Treasurer of the American Concrete Institute and Editor of the ACI *Journal*.

C. L. Warwick Bequest to the Society

IN HIS will the late Executive Secretary of the Society, C. Laurence Warwick, made a bequest of $500 to the Society. Because of Mr. Warwick's keen interest in the research activities of ASTM, the Board directed that the legacy should be added to the ASTM Research Fund which is used to sponsor and stimulate research within the technical committees of the Society.

Mr. Warwick, who died in 1952, was for 33 years the executive head of ASTM.

U. S. Delegation to ISO Plastics Meeting

AMERICAN representatives to the London meeting of ISO/TC 61 on Plastics, October 4–8, have been selected as follows:

Robert Burns, Bell Telephone Laboratories, *Leader*
Lucius Gilman, Ordnance Plastics Research Lab.
E. F. Seaman, Bureau of Ships
R. K. Witt, Johns Hopkins University
E. E. Ziegler, Dow Chemical Co.
C. L. Condit, Society of the Plastics Industry
G. M. Kline, National Bureau of Standards
R. R. Winans, New York Naval Shipyard
E. Y. Wolford, Koppers Co., Inc.
W. A. Zinzow, Bakelite Co.

At this meeting consideration will be given to a number of standardization projects of interest to Americans in the field. These will be reported on in the BULLETIN following the meeting.

Society Occupies Additional Headquarters Building

Purchase of Adjacent Building Provides Expansion for Rapidly Growing Society

Late in June several departments of the Headquarters Staff moved from the Race Street property, which had accommodated the entire Staff, to the Cherry Street property immediately at the rear of the main Headquarters building on Philadelphia's Benjamin Franklin Parkway.

The departments which have moved virtually in their entirety are the office of the Assistant Treasurer, Miss Dorothy P. Douty, including the bookkeeping, accounting, and related Staff; the publication order department under Miss Dorothy E. Hand including publication sales, billing, and shipping departments. Also moved to the remodeled building on Cherry St. were most of the storage bins and files which formerly occupied all available space in the basement of the Race Street property.

Announcement was made previously, both in the ASTM Bulletin (January, p. 21; February, p. 12) and the 1954 Report of the Board of Directors, of the negotiations leading to the procurement of the Cherry Street property. This property has a frontage of 90 ft on Cherry Street and extends back 129 ft to Quarry Street which is a narrow street at the back of the Race Street property. A part of the negotiations was the sale to the Academy of Natural Sciences of three quarters of the 80-ft lot fronting on Cherry St., which the Society purchased a few years ago. Thus with our remaining one quarter of this lot, we now have a frontage on Cherry Street of about 110 ft.

At some future time it may be feasible to arrange for closing Quarry Street which would then make available to the Society an additional area of 1200 sq ft and permit construction of an annex joining the two buildings.

The buildings on Cherry Street originally included a large garage with office space and housekeeping apartments on the second floor and a separate two-family dwelling. The office space and garage have been remodeled quite extensively. On the ground floor a much needed larger shipping room has been provided with a loading platform and ramp, extensive storage space, and considerable additional area for future use. Rooms at the rear of the building, one of which is being remodeled for a potential small meeting room, provide for additional expansion of office space.

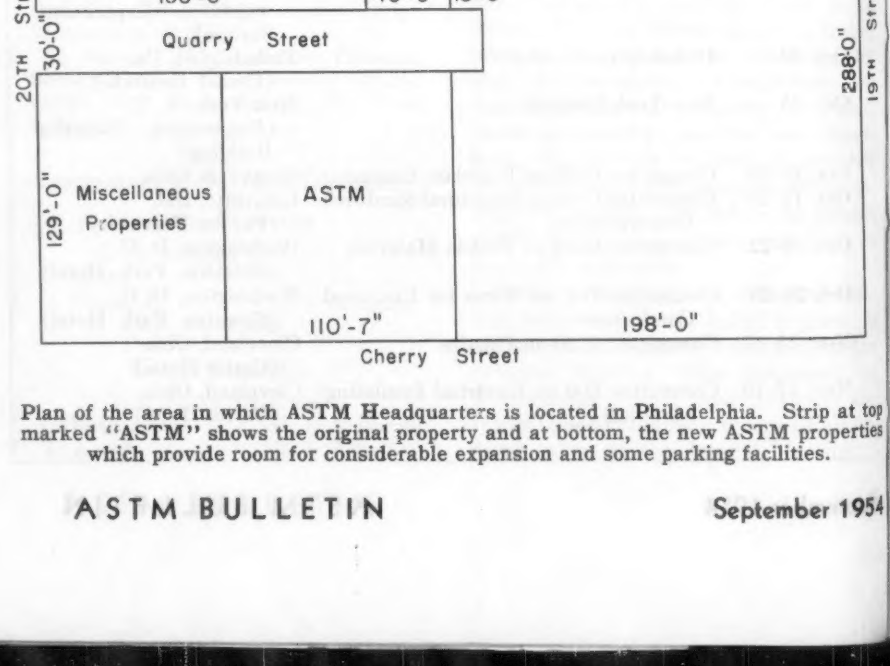
The Board of Directors is currently studying the disposition of the two-family dwellings which may be demolished to make room for additional off-street parking.

While it is difficult to foresee just what will take place in the redevelopment of this general area which is close to the land now being cleared of the former Pennsylvania Railroad tracks from the old Broad Street Station, there has been general agreement that Headquarters is in a desirable location, readily accessible from railroad stations downtown and, fronting as it does on the Parkway, in a very appropriate setting. Also, the Society is fortunate in having good neighbors on either side—the Academy of Natural Sciences and the Moore Institute of Art. The latter expects to erect a large school and dormitory building on the site of its present dormitories.

The Directors feel that strictly aside from the urgently needed facilities it provides, the Cherry Street property should prove to be a very good investment.

Payment for the new property and the cost of remodeling has been handled from current funds. The note which the Society General Fund holds on the new property will be paid off through rental charges. Discussion of the Headquarters building finances was given in the 1954 Report of the Board of Directors. Including the Race Street property and the total holdings on Cherry Street the balance sheet will show that total real estate assets will be about $380,000.

Members are cordially invited to inspect these new facilities. It is intended that they shall continue to provide the best service possible to our members and to meet the growing needs in industry for the publications resulting from our intensive standardization and research activities.



Plan of the area in which ASTM Headquarters is located in Philadelphia. Strip at top marked "ASTM" shows the original property and at bottom, the new ASTM properties which provide room for considerable expansion and some parking facilities.

Views of the new additional Headquarters building. *Top left*, the new building showing second floor offices and street floor shipping (note garage door for trucks). *Top right*, "before and after" views of one of the refurbished offices. *Bottom*, before and after views of the street level floor which has been partitioned to provide shipping room and storage space on the right of area formerly used as a garage.

Early Planning for 1956 West Coast Meeting Initiated by Arrangements Committee

The personnel of the Committee on Arrangements for the 1956 West Coast meeting which will be held September 16–22 at the Hotel Statler, Los Angeles, has now been completed and the ground work laid for what promises to be a most stimulating meeting.

While the Southern California District Council is taking the lead in setting up the Arrangements Committee, it is enlisting the help and counsel of not only the Northern California members but area members from several other industrial centers. The northern group designated some of its leading members to cooperate in the committee work and, as indicated below, three of the important committees, Technical Program, Finances, and Promotion and Publicity, will have a vice-chairman from the San Francisco area. A vice-chairman of the General Committee is also from San Francisco, and it is expected as the subcommittee personnel is filled in, there will be complete participation on the part of the west coast and mountain states.

It is hoped that quite a number of technical committees will be meeting there. Several have already signified their intention of doing so. Steps are being taken to elicit suggestions for pertinent technical papers and symposiums that not only would have an appeal particularly from the standpoint of the western areas but which would have general interest as well. The General Committee and subcommittee officers constitute an enthusiastic group; and while it may be too early for our members and committee members in the East definitely to plan on attendance, there is no question this meeting will be an excellent opportunity for our members to benefit from the good technical program and committee meetings that will be held, to enjoy the entertainment that will be provided and to visit one of the country's important industrial centers.

GENERAL COMMITTEE ON ARRANGEMENTS

Honorary Chairman	W. C. Hanna, Vice-President in Charge of Technical Development, California Portland Cement Co., Colton, Calif.
Chairman	E. O. Slater, President and Manager, Smith-Emery Co., Los Angeles
Vice-Chairman (N. California)	T. Parker Dresser, Jr., Chief Engineer, Abbott A. Hanks, Inc., San Francisco
Vice-Chairman (S. California)	C. M. Wakeman, Testing Engineer, Los Angeles Harbor Dept.
Secretary	M. B. Niesley, President, California Testing Laboratories, Inc., Los Angeles
Treasurer	(To be appointed)
Finance Committee	
Chairman	C. E. Emmons, Technologist, The Texas Co., Los Angeles
Vice-Chairman	L. A. O'Leary, Head, Chemical Engineering and Research Dept., W. P. Fuller and Co., South San Francisco
Technical Program	
Chairman	Frederick J. Converse, Associate Professor of Civil Engineering, California Institute of Technology, Pasadena
Vice-Chairman	Raymond E. Davis, Professor of Civil Engineering, University of California, Berkeley
Social and Entertainment	
Chairman	E. R. Millett, Jr., California Natural Gas Assn., Los Angeles
Vice-Chairman	C. E. P. Jeffreys, Director of Research, Truesdail Labs., Inc., Los Angeles
Transportation	
Chairman	C. W. Beardsley, Acting Director, Los Angeles Bureau of Standards
Vice-Chairman	Guy Corfied, Research Engineer, Southern California Gas Co., Los Angeles
Hotels	
Chairman	Ray Stringfield, Consulting Chemical Engineer, Los Angeles
Vice-Chairman	D. E. Bowers, General Petroleum Corp. of California, Los Angeles
Registration and Information	
Chairman	E. F. Green, Metallurgist, Axelson Manufacturing Co., Division of Pressed Steel Car Co., Los Angeles
Vice-Chairman	F. J. Robbins, President, Sierra Drawn Steel Corp., Los Angeles
Promotion and Publicity	
Chairman	Bert Folda, General Petroleum Corp., Los Angeles
Vice-Chairman	T. K. Cleveland, Chief Chemist, Philadelphia Quartz Co. of California, Berkeley
Plant Visits	
Chairman	J. B. Morey, Mechanical Engineer, International Nickel Co., Los Angeles (Chairman Southern California District)
Vice-Chairman	B. J. Weintz, Chief Engineer, Consolidated Rock Products Co., Los Angeles

Society of Rheology 1954 Annual Meeting

The Society of Rheology will hold its 1954 Annual Meeting in Washington, D. C., on November 3–5, 1954. The technical sessions will be held at the National Bureau of Standards, and the headquarters hotel will be the Sheraton Park.

Four main groups of papers are scheduled: (1) time-dependent mechanical behavior of monomeric liquids, elastomers, plastics, glass, and asphalts, (2) statistical and molecular theories of liquids with particular regard to rheological processes, (3) volumetric strain in monomeric liquids, glass, and organic polymers, and (4) critical velocities and impact strength, anisotropy, and chemically induced relaxation of fibers.

Among about twenty-five authors scheduled to give papers at the meeting are: Dean Henry Eyring of the University of Utah, Professors R. B. Lindsay, A. H. Lee, and R. S. Rivlin of Brown University, Dr. Charles Mack of Imperial Oil Limited, Sarnia, Canada, Professor A. Michels of the University of Amsterdam, Holland, and the University of Maryland, Dr. Melville Green of the University of Maryland, Dr. Simon Rodbard of Michael Reese Hospital, Chicago, and Dr. C. van der Poel of Royal Dutch Shell, Amsterdam, Holland.

Further information can be obtained from F. D. Dexter, Bakelite Co., Bound Brook, N. J.

Stimulating Programs Developing in Districts

October Meetings

A DOZEN meetings are already arranged for the various ASTM districts, starting in October. The Ohio Valley District leads off with the earliest meeting of the Fall season—a joint program with the Technical Association of the Pulp and Paper Industry in Dayton, Ohio, on October 7.

A meeting which should prove to be timely and which will undoubtedly result in extensive discussion is planned by the New York District for October 15. R. J. S. Pigott, past-president of American Society of Mechanical Engineers, and W. H. Larkin, Air Preheater Corp., have been invited to speak before a joint meeting of the New York ASTM District, the local group of the ASME and the New York Professional Engineers on the subject, "The Professional Development of Technical Men."

The President Speaks

ASTM President Normal L. Mochel, Westinghouse Electric Corp., is already tentatively planning to speak on ten different occasions, beginning in Philadelphia on October 13 at a meeting to be held at Drexel Institute of Technology. One of the highlights of this meeting will be the awarding of student membership prizes.

After the first of the year President Mochel will head west, stopping in St. Louis on January 25 to speak before a joint meeting of ASTM and the Missouri Society of Professional Engineers. Three meetings are planned for the Southwest District: Bartlesville, Okla., on February 8; Houston, Texas, on March 1; and Dallas, Texas, on March 3. The president will be the featured speaker at these three meetings which will be cosponsored by the American Society for Metals at all three cities, and in addition, in Bartlesville, by the Engineers Club. The president's trip to the three Southwest District locations will be broken by a West Coast tour beginning in Tacoma about the middle of February, followed by a meeting in San Francisco (Northern California District) and ending in Los Angeles (Southern California District) on February 24. An additional meeting may develop in Denver.

The Western New York-Ontario District also hopes to hear President Mochel in December. If details can be worked out, a meeting in Buffalo may be supplemented by additional meetings in either Rome, Utica, or Syracuse, and possibly a third meeting in the Toronto area.

University Meeting

The New England District, following the successful pattern established last year, is planning a meeting in October or November (the speaker for which has not yet been determined) and a second meeting in the spring. As a result of the successful technical session held at the University of Connecticut last spring a similar program is planned for presentation at the University of New Hampshire in Durham.

With so many meetings scheduled this far in advance, there is a possibility that some changes may be necessary, however, the schedule as outlined indicates a busy season, not only for our new president, but for all the ASTM Districts.

Election of District Councilors and Officers

THE September issue of the ASTM BULLETIN inevitably heralds the resumption of the ASTM District activities. In the past, the results of the elections for District officers and councilors have been announced in the summer. It is felt, however, that it is perhaps more timely to announce the results of these important elections at this time of year when technical men and engineers interested in the work of the Society have completed their vacations and are looking forward to another full and active year.

In accordance with the provisions of the ASTM Charter for Districts which has been in effect since 1947, ASTM members and committee members have elected new councilors and officers for their respective districts. The terms of about one half the councilors of each district expire in June of each year and district officers' terms expire in June of the even-numbered years. The names of all council members, the holdovers as well as those shown below, and the officers appear in the 1954 Year Book just off press.

Names of the new or re-elected councilors and officers who will hold office until June, 1956, are listed below. Please note that this is not a complete list of district councilors, but shows only those newly elected (marked with an asterisk) or re-elected this year.

Chicago

Chairman: H. P. Hagedorn, City of Chicago, Dept. of Purchases, Contracts, and Supplies
Vice-Chairman: W. L. Bowler, The Pure Oil Co.
Secretary: C. W. Muhlenbruch, Educational and Technical Consultants, Inc.

Councilors:

*C. E. Ambelang, Public Service Co. of Northern Illinois
*H. B. Emerson, Lehigh Portland Cement Co.
*J. G. Heiland, Bell & Howell Co.
*J. T. Jarman, Allis-Chalmers Mfg. Co.
*J. J. Kanter, Crane Co.
*V. C. Mehlenbacher, Swift and Co.
*C. A. Menzel, Portland Cement Assn.
*H. H. Morgan, Robert W. Hunt Co.
*J. E. Ott, Acme Steel Co.
M. C. Rogers, R. R. Donnelley & Sons Co.
*D. D. Rubek, Anderson-Prichard Oil Corp.
W. B. Tall, Western Electric Co.

Cleveland

Chairman: L. F. Herron, The James H. Herron Co.
Vice-Chairman: H. D. Churchill, Case Institute of Technology
Secretary: James H. Lansing, Malleable Founders' Soc.

Councilors:

*J. S. Adelson, Republic Steel Corp.
J. J. Allen, Firestone Tire & Rubber Co.
*R. T. Bayless, American Society for Metals
H. M. Bedell, National Spectrographic Laboratories, Inc.
*A. W. Carpenter, The B. F. Goodrich Co.
D. L. Colwell, Apex Smelting Co.
Edward Dyble, General Motors Corp., Cleveland Diesel Engine Div.
L. T. Fahrenthold, Cleveland Wire Works, General Electric Co.
H. H. Gorrie, Bailey Meter Co.
A. G. Gray, *Steel*, Penton Publishing Co.
E. C. Harris, Fenn College
*E. G. Kimmich, Goodyear Tire & Rubber Co.
*Joseph Prescott, The Cleveland Electric Illuminating Co.
R. A. Schaefer, Clevite-Brush Development Co.
E. W. Scripture, Jr., Master Builders Co.
W. E. Sicha, Aluminum Co. of America
*F. G. Steinebach, *Foundry*, Penton Publishing Co.
C. E. Sutherland, Reliance Electric & Engineering Co.
D. C. Williams, Addressograph Multigraph Corp.
*R. L. Wilson, Steel and Tube Div., Timken Roller Bearing Co.

Detroit

Chairman: R. B. Saltonstall, The Udylite Corp.
Vice-Chairman: C. O. Durbin, Chrysler Corp.
Secretary: Robert Sergeson, Rotary Electric Co.

Councilors:

A. R. Carr, Wayne University
*V. A. Crosby, Climax Molybdenum Co. of Michigan, Inc.

*W. R. Fraser, Michigan Consolidated Gas Co.
*C. M. Gambrill, Ethyl Corp.
*A. J. Herzig, Climax Molybdenum Co. of Michigan, Inc.
*L. J. Jacobi, The Detroit Edison Co.
*J. D. Ryan, Libbey-Owens-Ford Glass Co.
*C. A. Siebert, University of Michigan
*F. J. Walls, The International Nickel Co., Inc.

New England

Chairman: C. G. Lutts, Boston Naval Shipyard
Vice-Chairman: Daniel Cushing, Consulting Metallurgical Engineer
Secretary: R. W. Chadbourn, Boston Edison Co.

Councilors:
*H. J. Ball, Lowell Technological Institute
J. M. Bierer, Boston Woven Hose and Rubber Co.
*M. N. Clair, The Thompson & Lichtner Co., Inc.
*R. C. Corson, Associated Factory Mutual Fire Ins. Cos.
W. Goss, General Electric Co.
*E. A. Gramstorff, Northeastern University
Albert Haertlein, Harvard University
R. T. Healy, Connecticut State Highway Dept.
*H. H. Lester, Watertown Arsenal
*R. P. Mahan, Baird Associates

New York

Chairman: S. R. Doner, Raybestos-Manhattan, Inc.

Vice-Chairmen:
E. P. Pitman, Port of New York Authority
A. A. Jones, Anaconda Wire and Cable Co.
Secretary: L. T. Work, Consulting Engineer

Councilors:
W. B. Anderson, Titanium Pigment Corp.
*W. C. Bowden, Jr., Ledoux & Co.
*H. C. R. Carlson, The Carlson Co.
C. L. Condit, Society of the Plastics Industry, Inc.
*Myron Park Davis, New York and New Jersey Lubricating Co.
*Ephraim Freedman, R. H. Macy and Co.
G. J. Herbert, Bell Telephone Laboratories, Inc.
*G. O. Hiers, Consulting Metallurgist, Baldwin, N. Y.
William Kowalsky, Ramseyer & Miller, Inc.
*Jerome Strauss, Vanadium Corp. of America
*E. R. Thomas, Consolidated Edison Co. of N. Y., Inc.
*Gordon Thompson, Electrical Testing Laboratories
*J. S. Vanick, The International Nickel Co., Inc.
*R. M. Wilhelm, Miller & Weber, Inc., Glendale, L. I., N. Y.

Northern California

Chairman: H. P. Hoopes, Pabco Products, Inc.
Vice-Chairman: P. E. McCoy, American Bitumuls and Asphalt Co.
Secretary: R. W. Harrington, Clay Brick & Tile Assn.

Councilors:
*H. de Bussieres, Curtis & Tompkins, Ltd.
*T. Parker Dresser, Jr., Abbot A. Hanks, Inc.
*J. H. Dunn, Hersey Inspection Bureau
*P. V. Garin, Southern Pacific Co.
C. M. Herd, Calif. State Dept. of Public Works, Div. of Architecture
*L. A. O'Leary, W. P. Fuller & Co.
*M. C. Poulsen, Port Costa Brick Works
W. C. Riddell, Kaiser Gypsum Co., Inc.
*F. C. Smith, Bethlehem Pacific Coast Steel Corp.
*R. C. Vollmar, Standard Oil Co. of Calif.

Ohio Valley

Chairman: J. C. Pitzer, The Formica Co.
Vice-Chairman: R. S. Armstrong, The Standard Oil Co.
Secretary: A. Hurtgen, Henry Vogt Machine Co.

Councilors:
*J. H. Calbeck, American Zinc Sales Co.
*H. B. Currens, Lilly Varnish Co.
*A. W. F. Green, Allison Div., General Motors Corp.
H. W. Greider, The Philip Carey Mfg. Co.
*J. C. Harris, Monsanto Chemical Co.
*R. L. Kenyon, Armco Steel Corp.
*R. P. Koehring, Moraine Products Div., General Motors Corp.
G. N. Krouse, Krouse Testing Machine Co.
R. D. McGill, H. C. Nutting Co.
*H. C. Schwalbe, Mead Corp.
*F. C. Smith, Tube Turns

Philadelphia

Chairman: E. K. Spring, Henry Disston and Sons, Inc.

Vice-Chairmen:
Tinius Olsen, 2nd, Tinius Olsen Testing Machine Co.
L. D. Betz, W. H. and L. D. Betz
Secretary: A. H. Kidder, Philadelphia Electric Co.

Councilors:
*E. J. Albert, Thwing-Albert Instrument Co.
C. J. Code, The Pennsylvania Railroad Co.
E. S. Garverich, Pennsylvania Salt Mfg. Co.
*Henry Grinsfelder, Rohm & Haas
*E. O. Hausman, Continental-Diamond Fibre Co., Newark, Del.
K. G. Krech, The Atlantic Refining Co.
J. S. Roberts, American Manganese Bronze Co.
*A. O. Schaefer, The Midvale Co.
*H. W. Stuart, U. S. Pipe and Foundry Co.
*F. G. Tatnall, Baldwin-Lima-Hamilton Corp.
*Percival Theel, Philadelphia Textile Institute

Pittsburgh

Chairman: H. A. Ball, Ball Chemical Co.
Vice-Chairman: C. H. Sawyer, Eastern Gas and Fuel Associates
Secretary: A. L. Johnson, Universal Rundle Corp.

Councilors:
*M. D. Baker, West Penn Power Co.
*S. A. Braley, Pittsburgh Steel Co.
*W. S. Debenham, United States Steel Corp.
*H. F. Hebley, Pittsburgh Consolidation Coal Co.
E. M. Kipp, Aluminum Research Labs.
*F. T. Mavis, Carnegie Institute of Technology
A. S. Orr, Gulf Oil Corp.
C. L. Potter, Jones & Laughlin Steel Corp.
*Mary E. Warga, University of Pittsburgh

St. Louis

Chairman: J. M. Wendling, City of St. Louis, Municipal Testing Lab.
Vice-Chairman: W. C. Magruder, Carter Carburetor Co.
Secretary: J. R. Romig, Missouri Portland Cement Co.

Councilors:
*J. E. Brock, Midwest Piping Co.
*A. W. Brust, Washington University
*E. H. Harvey, Jr., Moloney Electric Co.
*L. C. Hewitt, Laclede-Christy Co.
*S. B. Roberts, Robert W. Hunt Co.
*C. B. Roen, Monsanto Chemical Co.
*H. W. Russell, Illinois State Div. of Highways, Bureau of Materials
*A. F. Schwarz, Jr., Russell, Margardt & Schwarz
*J. W. Shurig, National Lead Co.
*H. E. Wiedemann, Consulting Chemist

Southern California

Chairman: J. B. Morey, The International Nickel Co., Inc.
Vice-Chairman: M. B. Niesley, California Testing Labs., Inc.
Secretary: Byron Weintz, Consolidated Rock Products Co.

Councilors:
C. R. Baker, Pacific Tube Co.
*C. W. Beardsley, City of Los Angeles, Bureau of Standards
*E. O. Bergman, C. F. Braun and Co.
D. E. Bowers, General Petroleum Corp. of Calif.
*F. J. Converse, California Institute of Technology
*John Delmonte, Furane Plastics, Inc.
F. B. Doolittle, Southern California Edison Co.
*C. E. Emmons, The Texas Co.
*W. C. Hanna, California Portland Cement Co.
J. B. Howe, Maurseth & Howe
G. R. Little, City of Los Angeles, Dept. of Water and Power
*Ray Stringfield, Consulting Chemical Engineer
*C. M. Wakeman, City of Los Angeles, Harbor Dept.
Harry Welch, Western Precipitation Co.
*Bruce Wiker, County of Los Angeles, Road Dept.
H. C. Zweifel, Richfield Oil Corp.

Southwest

Chairman: *M. E. Holmberg, Metallurgical Consultant
Vice-Chairmen:
*R. C. Alden, Philips Petroleum Co.
*P. L. DeVerter, Humble Oil & Refining Co.
*A. W. Eatman, Texas State Highway Dept.
*Edwin Joyce, American Petroleum Inst.
Secretary: *J. B. Baird, Southwestern Laboratories

Councilors:
*E. E. Berkley, Anderson, Clayton & Co.
*K. P. Campbell, Sheffield Steel Corp.
*C. M. Conrad, Southern Regional Research Laboratory
*R. P. Daniels, Gulf Oil Corp.
*R. F. Dawson, University of Texas
*W. G. Hall, Shell Chemical Corp.
*A. J. Hoiberg, Lion Oil Co.
*W. F. Lowe, Natural Gasoline Assoc. of America
*B. B. Manuel, W. H. Curtin & Co.
*H. L. McMullin, Texas & Pacific Railway Co.
*C. R. Neilon, The National Supply Co.
*F. B. Porter, Southwestern Laboratories
*M. V. Reed, Dallas Tank Co., Inc.
*D. G. Reid
*J. E. Russell, Texas Solvents and Chemicals Co.
*E. F. Schmidt, Lone Star Gas Co.
*O. R. Sherman, Pittsburgh Testing Laboratory
*H. N. Simms, Black, Sivalls & Bryson, Inc.
*R. P. Witt, Oklahoma A & M College

Washington, D. C.

Chairman: Fred Burggraf, Highway Research Board, National Research Council

Vice-Chairmen:
George Kimber, Calcium Chloride Inst.
A. B. Cornthwaite, Commonwealth of Virginia, Dept. of Highways
C. E. Proudley, North Carolina State Highway and Public Works Commission
R. W. Seniff, The Baltimore and Ohio Railroad Co.
G. G. Sward, National Paint, Varnish and Lacquer Assoc.
Secretary: G. G. Sward, National Paint, Varnish and Lacquer Assoc.

Councilors:
*R. C. Brand
F. B. Brown, Wire Reinforcement Inst.
*J. R. Dwyer, National Bureau of Standards
Harry K. Fisher, Natural Rubber Bureau
Joseph E. Gray, National Crushed Stone Assoc.,Inc.
*M. H. Hall, Olga Coal Co.
F. J. Hanrahan, American Institute of Timber Construction
Edward L. Hollady, Office Chief of Ordnance, U. S. Dept. of the Army
*Earl F. Kelley, Bureau of Public Roads, Dept. of Commerce
A. T. McPherson, National Bureau of Standards
H. A. Mereness, Institute of Textile Technology
*Thomas Pringle, U. S. Corps of Engineers
W. H. Reynolds, American Instrument Co.
P. R. Stone, U. S. Navy, Bureau of Aeronautics

Western New York-Ontario

Chairman: *F. A. Webber, The Colorado Fuel and Iron Corp., Wickwire Spencer Steel Div.
Vice-Chairmen: *G. J. Gaukroger, The McKinnon Industries, Ltd.
*Louis Shnidman, Rochester Gas and Electric Corp.
Secretary: *Clarence Lamoreaux, The Federal Portland Cement Co., Inc.

Councilors:
*H. A. Campbell, Bell Aircraft Corp.
O. W. Ellis, Ontario Research Foundation
*L. V. Foster, Bausch & Lomb Optical Co.
*Joseph Gentile, Pittsburgh Testing Laboratories
*L. F. Hoyt, National Aniline Div., Allied Chemical & Dye Corp.
H. W. Jewell, National Sewer Pipe Co., Ltd.
C. W. Mason, Cornell University
*T. L. Mayer, Buffalo & Erie County Public Library
W. H. Miller, Erie Bolt & Nut Co.
*R. W. Morgan, Fedders-Quigan Corp.
E. J. Nunan, The Buffalo Slag Co., Inc.
*C. L. Pope, Eastman Kodak Co.
*I. M. Schultz, Harrison Radiator Div., General Motors Corp.
R. N. Stenerson, Carrier Corp.

Pittsburgh Diffraction Conference

The Twelfth Annual Pittsburgh Diffraction Conference will be held at the Mellon Institute, Pittsburgh, Pa., on Nov. 3, 4, and 5, 1954. This will be a joint meeting with the American Crystallographic Assn. Technical sessions are being arranged on Instrumentation and Methods, Metals, Neutron Diffraction, Small-Angle Scattering, and Silicates and Related Structures. Papers on general diffraction subjects will also be accepted.

For further information and for a copy of the preliminary program when available, write to P. K. Koh, Allegheny Ludlum Research Laboratories, Alabama Ave., Brackenridge, Pa.

ACR Notes

Printed on behalf of the Administrative Committee on Research

As indicated in earlier issues of this column, many replies were received as a result of the distribution of the ACR pamphlet, **Some Unsolved Problems.** One of the questions raised in these letters was: "Where can the interest to perform such work be created?" As a suggestion toward accomplishing this end, the comments of H. H. Morgan, president of the Society in 1939–1940, are published below.

Comments on Research and Its Value to Industry

"Research, whether fundamental research, industrial research, or production development research, is necessary to maintain continuing advancement of our industry products and to maintain our enviable position in world progress. Research generally and properly must be paid for from the profits of industry.

"Stimulating industries to undertake and finance research of one form or another is vital to progress. To show value received, I am presenting the interests of industry in the reverse of the usual order of consideration. Briefly I will progress from the purely selfish value to a specific manufacturer to the ideology of the so-called fundamental research."

First Stage.—"The individual manufacturer of the product must continuously improve his existing product and develop new devices for his present customers aside from finding new and expanding markets. Research is insurance that he can maintain his position in a competitive business with others making similar products.

"Furthermore, markets are changing and unless he keeps ahead of his competitor his product may become obsolete. Research of this type must of necessity be handled within his own organization or he may go to such outside sources, on a confidential basis, as commercial testing and consultation laboratories who, with the benefit of broader experience, can assist in the particular product's research development. This production research requires well balanced teamwork on the part of management, sales, and manufacturing departments of the manufacturer and the confidential constructive work of the commercial laboratory assisting in the research program.

"The experience of countless manufacturers in maintaining their position in competitive markets has proven the value of this research."

Second Stage.—"Groups of manufacturers producing the same lines of products for our business economy find that their collective business warrants studies, tests, and other research programs in order that they may stimulate and maintain a market for their products in the face of competing types.

"This generally means research in many features of the design of the type of products, the use of distinctly different manufacturing procedures and I know, in some cases, an entire change in the materials used in component parts; also, when the collective products have established a firm end use, standardization and control by the manufacturers' group association or other alliance is necessary. All this comes under the heading of industrial research and, for such associations, the commercial testing laboratories are best fitted to handle it from an experienced, unprejudiced, and confidential approach."

Third Stage.—"Now as research develops from the individual manufacturer (First Stage) to the collective manufacturers (Second Stage), it then commences to develop broader application and it is then that it is realized that colleges and other educational institutions can be used through fellowship or other means to develop information and data on the needs for a solution of unsolved problems. Such problems are generally of broader fields of application than those of interest under Stage 2 and, of course, Stage 1."

Fourth Stage.—"The fourth stage of research is, of course, fundamental research and that is recognized as the development of applied genius and may be the outcropping of some idea under Stages 1, 2, and 3 or may be fundamentally determined by the strictly idealistic research approach wherein some phenomenon of nature is recognized and a research inspired. Such research may be undertaken by an individual, education institution, or research foundation. Any of these activities may be supported by individuals, companies, or governmental support, all depending on the ultimate use of the research findings for individual, industry, or general public value."

Comments concerning the content of this column would be appreciated and should be addressed to the Secretary, Administrative Committee on Research, ASTM Headquarters, 1916 Race St., Philadelphia 3, Pa.

Water Conference

The 15th Annual Water Conference of the Engineers' Society of Western Pennsylvania will be held Oct. 18–20, 1954, at the Hotel William Penn, Pittsburgh, Pa.

A total of 22 papers will be presented at the meetings, including panels on stream pollution and demineralization and a session sponsored by the Joint Committee on Boiler Feedwater Studies.

New Research Director at ASHVE

Elmer R. Kaiser, Columbus, Ohio, has been appointed Director of Research for the American Society of Heating and Ventilating Engineers.

Mr. Kaiser has been actively engaged in research work, particularly in the field of fuels, and during the past 20 years has served on the staff of Battelle Memorial Institute and with Bituminous Coal Research.

COMMITTEE HONORS

From time to time the Bulletin will publish the texts of the scrolls presented by the various committees in appreciation of outstanding contributions by individual members.

AN APPRECIATION

On the occasion of the resignation of Lawrence Addicks from the American Society for Testing Materials, the members of Committee B-2 wish to express their regret that they will no longer have his active participation in their discussions regarding the formulation of Specifications for Non-Ferrous Metals and Alloys.

Mr. Addicks was elected to membership in the Society in 1910 and continuously since then has been a very active and valuable member of Subcommittee 1 which until 1913 dealt with Pure Metals in Ingot Form. He also has been an active member of Subcommittees 2 and 5.

His valuable contributions in the science of metallurgy, particularly the refining of copper, are so well known they need not be cited here. However, it might be well to record that by common consent, he is considered the highest authority in the land on the refining of copper and the members of Committee B-2 feel proud and happy they were privileged to have him as one of their members during these many years.

They wish to thank him for his valuable assistance and extend to him their best wishes for continued good health and happiness.

For Committee B-2
Bruce W. Gonser
Chairman

G. Howard Le Fevre
Secretary

30th day of November, 1953

RESOLUTION

WHEREAS—ALFRED W. GAUGER

After more than 14 years as chairman of Committee D-3 on Gaseous Fuels of the American Society for Testing Materials, charged with the preparation of standard methods for determination of physical and chemi-

cal characteristics of gaseous fuels, has now found it necessary to relinquish his duties of direct leadership and,

WHEREAS,

As Director of the Mineral Industries Experiment Station of The Pennsylvania State College for many years, he had direct charge of much valuable research work performed for the above-mentioned Society, its Gaseous Fuels Committee and the gas industry and,

WHEREAS,

He is the author of many valuable reports and scientific publications promoting a better understanding and a greater knowledge of the science of metals and of gas engineering,

NOW THEREFORE BE IT RESOLVED,

That Committee D-3 on Gaseous Fuels in meeting with its various subcommittees expresses its sincere gratitude and thanks to Alfred W. Gauger for his inspiring leadership in this committee's standardization program and its deep appreciation of his outstanding personal accomplishments in bringing this program to its present position, and,

BE IT FURTHER RESOLVED,

That a suitably engraved copy of this resolution signed by the officers of Committee D-3 on Gaseous Fuels be presented to Alfred W. Gauger in grateful acknowledgment of his wise leadership and untiring efforts, so largely responsible for the success its program has attained.

Use of Minimum and Average Wall Tubes in Boilers and Other Pressure Vessels

In answer to an inquiry from the ASA Chemical Industry Advisory Board to the Boiler Code Committee of The American Society of Mechanical Engineers regarding the possibility of using average wall tubes in Code vessels, the following resolution was adopted by the Boiler Code Committee as a statement of principle:

Tubes of approved materials, no matter how specified as to thickness, may be used in Code vessels provided the permissible under tolerance does not reduce the thickness below that required by the applicable Code for the pressure and temperature condition of design.

Technical Committee Chairmen and Secretaries

LISTED below are chairmen and secretaries of all ASTM technical committees. The 1954 ASTM Year Book contains complete lists of officers and personnel of the various committees. The asterisk indicates new officers.

Committee	Chairman	Secretary
A-1 on Steel	H. B. Oatley, Great Neck, L. I., N. Y.	*H. L. Fry, Bethlehem Steel Co., Inc., Bethlehem, Pa.
A-2 on Wrought Iron	A. D. Morris, Bayonne Bolt Corp., New York, N. Y.	L. S. Crane, Southern Railway System, Alexandria, Va.
A-3 on Cast Iron	*H. W. Stuart, U. S. Pipe & Foundry Co., Burlington, N. J.	*T. E. Eagan, The Cooper-Bessemer Corp., Grove City, Pa.
A-5 on Corrosion of Iron and Steel	A. P. Jahn, Bell Telephone Laboratories, Inc., Murray Hill, N. J.	C. P. Larrabee, United States Steel Corp., Vandergrift, Pa.
A-6 on Magnetic Properties	*A. C. Beiler, Westinghouse Elec. Corp., Pittsburgh, Pa.	M. Getting, Jr., Allis-Chalmers Mfg. Co., Pittsburgh, Pa.
A-7 on Malleable Iron Castings	W. A. Kennedy, Grinnell Co. Inc., Providence, R. I.	J. H. Lansing, Malleable Founders Soc., Cleveland, Ohio
A-9 on Ferro Alloys	W. C. Bowden, Jr., Ledoux & Co., Teaneck, N. J.	*J. J. Crowe, Air Reduction Co., Union, N. J.
A-10 on Iron-Chromium, Iron - Chromium - Nickel and Related Alloys	Jerome Strauss, Vanadium Corp. of America, New York, N. Y.	M. A. Cordovi, The Babcock Wilcox Co., New York, N. Y.
B-1 on Wires for Electrical Conductors	D. Halloran, Consolidated Edison Co. of New York, Inc., New York, N. Y.	A. A. Jones, Anaconda Wire and Cable Co., Hastings-on-Hudson, N. Y.
B-2 on Non-Ferrous Metals and Alloys	B. W. Gonser, Battelle Memorial Inst., Columbus, Ohio	G. H. LeFevre, U. S. Smelting, Refining & Mining Co., New York, N. Y.
B-3 on Corrosion of Non-Ferrous Metals and Alloys	K. G. Compton, Bell Telephone Laboratories, Inc., Murray Hill, N. J.	A. W. Tracy, The American Brass Co., Waterbury, Conn.
B-4 on Metals for Electrical Heating, Electrical Resistance, and Electronic Applications	S. A. Standing, Raytheon Mfg. Co., Quincy, Mass.	Stanton Umbreit, Radio Corp. of America, Harrison, N. J.
B-5 on Copper and Copper Alloys	G. H. Harnden, General Electric Co., Schenectady, N. Y.	V. P. Weaver, The American Brass Co., Waterbury, Conn.
B-6 on Die-Cast Metals and Alloys	W. Babington, Bell Telephone Laboratories, Inc., Murray Hill, N. J.	G. L. Werley, The New Jersey Zinc Co., Palmerton, Pa.
B-7 on Light Metals and Alloys, Cast and Wrought	I. V. Williams, Bell Telephone Laboratories, Inc., Murray Hill, N. J.	R. B. Smith, Reynolds Metals Co., Louisville, Ky
B-8 on Electrodeposited Metallic Coatings	C. H. Sample, The International Nickel Co., Inc., New York, N. Y.	R. B. Saltonstall, The Udylite Corp., Detroit, Mich.
B-9 on Metal Powders and Metal Powder Products	F. V. Lenel, Rensselaer Polytechnic Inst., Troy, N. Y.	C. G. Johnson, Presmet Corp. Worcester, Mass.
C-1 on Cement	R. R. Litehiser, Ohio State Highway Testing Laboratory, Columbus, Ohio	W. S. Weaver, Canada Cement Co., Ltd., Montreal, Canada
C-2 on Magnesium Oxychloride and Oxysulfate Cements	*D. S. Hubbell, Mellon Inst. of Industrial Research, Pittsburgh, Pa.	J. B. James, Oxychloride Cement Assn., Washington, D. C.
C-3 on Chemical Resistant Mortars	Beaumont Thomas, Stebbins Engineering and Manufacturing Co., Watertown, N. Y.	J. R. Allen, E. I. du Pont de Nemours and Co., Inc., Wilmington, Del.
C-4 on Clay Pipe	J. C. Riedel, 505 Macon St., Brooklyn 33, N. Y.	R. G. Scott, Clay Products Assn., Chicago, Ill.
C-7 on Lime	J. A. Murray, Massachusetts Institute of Technology, Cambridge, Mass.	R. S. Boynton, National Lime Assn., Washington, D. C.
C-8 on Refractories	R. B. Sosman, Rutgers University, New Brunswick, N. J.	W. R. Kerr, Armstrong Cork Co., Beaver Falls, Pa.
C-9 on Concrete and Concrete Aggregates	*W. H. Price, U. S. Bureau of Reclamation, Denver, Colo.	Bryant Mather, Waterways Experiment Station, Jackson, Miss.
C-11 on Gypsum	*G. W. Josephson, U. S. Bureau of Mines, Washington, D. C.	*O. H. Storey, Jr., Gypsum Assn., Chicago, Ill.
C-12 on Mortars for Unit Masonry	*R. E. Copeland, Nat. Concrete Masonry Assn., Chicago, Ill.	J. A. Murray, Massachusetts Institute of Technology, Cambridge, Mass
C-13 on Concrete Pipe	R. R. Litehiser, Ohio State Highway Testing Laboratory, Columbus, Ohio	H. F. Peckworth, American Concrete Pipe Assn., Chicago, Ill.

C-14 on Glass and Glass Products	L. G. Ghering, Preston Laboratories, Butler, Pa.	F. V. Tooley, University of Illinois, Urbana, Ill.
C-15 on Manufactured Masonry Units	J. W. Whittemore, Virginia Polytechnic Inst., Blacksburg, Va.	M. H. Allen, Structural Clay Products Research Foundation, Chicago, Ill.
C-16 on Thermal Insulating Materials	E. R. Queer, The Pennsylvania State University, State College, Pa.	W. L. Gantz, American Viscose Corp., Philadelphia, Pa.
C-17 on Asbestos-Cement Products	*D. Wolochow, National Research Council of Canada, Ottawa, Ont., Canada	C. C. Kelsey, Asbestos-Cement Products Assn., New York, N. Y.
C-18 on Natural Building Stones	L. W. Currier, U. S. Geological Survey, Washington, D. C.	F. S. Eaton, Research and Design Inst., New Haven, Conn.
C-19 on Structural Sandwich Constructions	E. W. Kuenzi, U. S. Forest Products Laboratory, Madison, Wis.	W. L. Emerson, Goodyear Aircraft Corp., Akron, Ohio
C-20 on Acoustical Materials	H. A. Leedy, Armour Research Foundation, Chicago, Ill.	H. J. Sabine, The Celotex Corp., Chicago, Ill.
C-21 on Ceramic Whiteware and Similar Products	*C. J. Koenig, Ohio State University, Columbus, Ohio	*A. J. Gitter, Whittaker, Clark & Daniels, Inc., New York, N. Y.
C-22 on Porcelain Enamel	W. N. Harrison, National Bureau of Standards, Washington, D. C.	G. H. Spencer-Strong, Pemco Corp., Baltimore, Md.
D-1 on Paint, Varnish, Lacquer and Related Products	W. T. Pearce, Bala-Cynwyd, Pa.	W. A. Gloger, National Lead Co., Brooklyn, N. Y.
D-2 on Petroleum Products and Lubricants	O. L. Maag, Timken Roller Bearing Co., Canton, Ohio	W. T. Gunn, American Petroleum Inst., New York, N. Y.
D-3 on Gaseous Fuels	*L. T. Bissey, The Pennsylvania State University, State College, Pa.	K. R. Knapp, American Gas Assn., Cleveland, Ohio
D-4 on Road and Paving Materials	*C. W. Allen, Ohio State Dept. of Highways, Columbus, Ohio	*J. M. Griffith, The Asphalt Inst., New York, N. Y.
D-5 on Coal and Coke	W. W. Anderson, Commercial Testing and Engineering Co., Chicago, Ill.	O. P. Brysch, Institute of Gas Technology, Chicago, Ill.
D-6 on Paper and Paper Products	W. R. Willets, Titanium Pigment Corp., New York, N.Y.	R. H. Carter, General Electric Co., Schenectady, N. Y.
D-7 on Wood	L. J. Markwardt, U. S. Forest Products Laboratory, Madison, Wis.	L. W. Smith, U. S. Forest Service, Washington, D. C.
D-8 on Bituminous Waterproofing and Roofing Materials	H. R. Snoke, National Bureau of Standards, Washington, D.C.	G. W. Robbins, The Texas Co., New York, N. Y.
D-9 on Electrical Insulating Materials	A. H. Scott, National Bureau of Standards, Washington, D. C.	B. E. Ely, E. I. du Pont de Nemours and Co., Inc., Wilmington, Del.; A. J. Balch, Synthane Corp., Oaks, Pa.
D-10 on Shipping Containers	G. E. Falkenau, E. I. du Pont de Nemours and Co., Inc., Wilmington, Del.	R. F. Uncles, American Cyanamid Co., New York, N. Y.
D-11 on Rubber and Rubber-Like Materials	Simon Collier, Johns-Manville Corp., New York, N. Y.	A. W. Carpenter, The B. F. Goodrich Co., Akron, Ohio
D-12 on Soaps and Other Detergents	J. C. Harris, Monsanto Chemical Co., Dayton, Ohio	H. R. Suter, Wyandotte Chemicals Corp., Wyandotte, Mich.
D-13 on Textile Materials	W. D. Appel, National Bureau of Standards, Washington, D. C.	W. H. Whitcomb, Cranston, R. I.
D-14 on Adhesives	*R. F. Blomquist, U. S. Forest Products Laboratory, Madison, Wis.	*C. K. Merrill Winne, Koppers Co., Inc., Petrolia, Pa.
D-15 on Engine Antifreezes	H. R. Wolf, General Motors Corp., Detroit, Mich.	C. F. Graham, Wyandotte Chemicals Corp., Wyandotte, Mich.
D-16 on Industrial Aromatic Hydrocarbons	D. F. Gould, The Borden Co., Philadelphia, Pa.	F. J. Powell, The Barrett Div. Allied Chemical and Dye Corp., Philadelphia, Pa.
D-17 on Naval Stores	V. E. Grotlisch, Naval Stores Branch, Tobacco Div., AMS, Dept. of Agriculture, Washington, D. C.	W. A. Kirklin, Hercules Powder Co., Wilmington, Del.
D-18 on Soils for Engineering Purposes	E. J. Kilcawley, Rensselaer Polytechnic Inst., Troy, N.Y.	W. G. Holtz, Bureau of Reclamation, Denver, Colo.
D-19 on Industrial Water	Max Hecht, 64 Jesup Pl., New York, N. Y.	*O. M. Elliott, Sun Oil Co., Philadelphia, Pa.
D-20 on Plastics	R. K. Witt, Johns Hopkins Univ., Baltimore, Md.	G. M. Armstrong, Tennessee Eastman Div., Eastman Kodak Co., Kingsport, Tenn.
D-21 on Wax Polishes and Related Material	W. W. Walton, National Bureau of Standards, Washington, D. C.	B. S. Johnson, Franklin Research Co., Philadelphia, Pa.
D-22 on Methods of Atmospheric Sampling and Analysis	L. C. McCabe, Bureau of Mines, Washington, D. C.	H. H. Schrenk, Industrial Hygiene Foundation, Pittsburgh, Pa.

(*Continued on page 35*)

Neutralized Vinsol Resin

EARLY in 1953 the Working Committee on Additions of Committee C-1 on Cement was informed by the manufacturer of neutralized Vinsol resin (NVX) that it was desirable to change the method of neutralizing the resin in order to decrease the possibility of combustion under high ambient air temperatures while the material was in storage or in transit. Prior to that time, the resin was neutralized with sodium hydroxide. It was proposed to use sodium carbonate instead, but the resin neutralized with sodium hydroxide would still be supplied to those who request it.

It was the opinion of the manufacturer, substantiated by experience and test data, that, with either method of neutralization, the air-entraining efficiency would be the same. After studying the matter, the committee held the same opinion, but decided to confirm it tangibly by a series of tests of its own. Those tests revealed practically no difference in the air-entraining property of the two materials or in their effect upon concrete and mortars in which they were used. Committee C-1, therefore, has recommended that the following resolution be published as information:

"Committee C-1 on Cement has found that Vinsol resin, for use as an interground air-entraining agent for portland cement, may be acceptably neutralized under heat and pressure with amounts of sodium carbonate chemically equivalent to the amounts of sodium hydroxide specified for neutralization in Specifications C 175."[1]

[1] Specifications for Air-Entraining Portland Cement (C 175 – 53), 1953 Book of ASTM Standards, Part 3, p. 6.

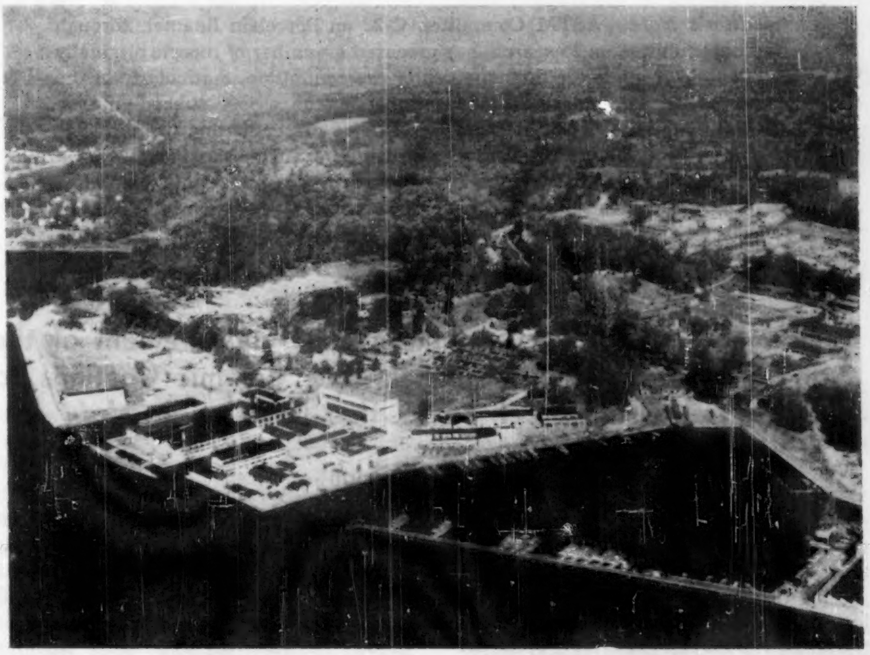
Effluent Air and Gas Cleaning Equipment Committee

EFFLUENT Air and Gas Cleaning Equipment, a new national committee to be composed of representatives of all interested organizations, will work under the procedures of the American Standards Assn.

The committee will work out standards relating to the fundamentals of performance of effluent air and gas cleaning equipment or devices used for the treatment of substances flowing into the air.

The American Society of Mechanical Engineers and the American Society of Heating and Ventilating Engineers were approved by the Safety Standards Board of the American Standards Association as possible sponsors. ASTM has been invited to send a representative.

Naval Engineering Experiment Station Observes Golden Anniversary



THE 50th Anniversary of the United States Naval Engineering Experiment Station was celebrated at Annapolis with a two-day open house attended by a number of Government and Navy officials. The Station has given sturdy support to the work of ASTM since 1911 when its membership began and at the present time has representatives serving on 20 committees of the Society.

During the ceremonies which were opened by Captain Fred W. Walton, Director of the Station, Governor Theordore R. McKeldin of Maryland, spoke of a 1903 issue of the British magazine *Engineering*, which referred with a touch of envy to the appropriation of the U. S. Congress of £80,000 ($400,000) for the establishment of a Naval Engineering Station. That the station was started was due largely to the efforts of Rear Admiral George W. Melville, Engineer-in-Chief of the Navy from 1887 to 1903.

Vice-Admiral C. Turner Joy, Superintendent of the Naval Academy commented on the fact that while everyone is familiar with the Naval Academy and relatively few know the work of the Engineering Experiment Station, one could not exist without the other: the Academy is a proving ground for men, the EES a proving ground for materials.

Others participating in the celebration were Vice-Admiral Roscoe F. Good, Deputy Chief of Naval Operations; James G. O'Neill, retired Superintendent of the Chemical Engineering Laboratory; and Rear Admiral Wilson D. Leggett, Jr., Chief of the Bureau of Ships.

The ceremonies were concluded with presentation of scrolls to employees who had served 35 years at EES. The employee with the longest continuous service is Laurence Thompson who joined the staff in 1915 and has followed the progress of ASTM Committee A-5 atmospheric sheet tests since their beginning in 1916.

Boiler Water Chemistry Symposium

A SYMPOSIUM on Boiler Water Chemistry, jointly sponsored by the American Chemical Society's Division of Water, Sewage, and Sanitation Chemistry, and the Joint Research Committee on Boiler Feedwater Studies, was a feature of the 124th meeting of the ACS in Chicago.

Papers and authors are as follows:

Water Conditioning Gadgets—B. Q. Welder and E. P. Partridge
Analysis of Water-Formed Deposits—F. U. Neat and A. A. Berk
Analysis of Industrial Water—J. H. Phillips and K. G. Stoffer
Application of Water Analysis Data—R. C. Ulmer
Boiler Deposit Analysis—F. E. Clarke and R. D. Hopkins

(*Continued from page 34*)

D-23 on Cellulose and Cellulose Derivatives	F. A. Simmonds, U. S. Forest Products Laboratory, Madison, Wis.	W. W. Becker, Hercules Powder Co., Wilmington, Del.
E-1 on Methods of Testing	J. R. Townsend, Sandia Corp., Albuquerque, N. Mex.	P. J. Smith, American Society for Testing Materials, Philadelphia, Pa.
E-2 on Emission Spectroscopy	*J. R. Churchill, Aluminum Research Laboratory, New Kensington, Pa.	*C. Feldman, Oak Ridge National Laboratory, Oak Ridge, Tenn.
E-3 on Chemical Analysis of Metals	*Arba Thomas, Armco Steel Corp., Middletown, Ohio	H. Kirtchik, General Electric Co., Evendale, Ohio
E-4 on Metallography	L. L. Wyman, National Bureau of Standards, Washington, D. C.	Mary Norton, Watertown Arsenal, Watertown, Mass.
E-5 on Fire Tests of Material and Constructions	A. L. Brown, Associated Factory Mutual Fire Insurance Cos., Boston, Mass.	R. C. Corson, Associated Factory Mutual Fire Insurance Cos., Boston, Mass.
E-6 on Methods of Testing Building Constructions	*R. F. Legget, National Research Council of Canada, Ottawa, Ont., Canada	R. A. Biggs, Franki Foundation Co., New York, N. Y.
E-7 on Non-Destructive Testing	J. H. Bly, X-ray Incorporated, Detroit, Mich.	*Alexander Gobus, North American Philips Co., Inc., Mt. Vernon, N. Y.
E-8 on Nomenclature and Definitions	P. V. Faragher, Aluminum Company of America, Pittsburgh, Pa.	P. J. Smith, American Society for Testing Materials, Philadelphia, Pa.
E-9 on Fatigue	R. E. Peterson, Westinghouse Electric Corp., East Pittsburgh, Pa.	O. J. Horger, The Timken Roller Bearing Co., Canton, Ohio
E-10 on Radioactive Isotopes	G. D. Calkins, Battelle Mem. Inst., Columbus, Ohio	C. E. Weber, General Electric Co., Schenectady, N. Y.
E-11 on Quality-Control of Materials	H. F. Dodge, Bell Telephone Laboratories, New York, N. Y.	O. P. Beckwith, Fabric Research Laboratories, Inc., Boston, Mass.
E-12 on Appearance	M. R. Paul, Eagle-Picher Sales Co., Washington, D. C.	*R. S. Hunter, Hunter Associates Laboratory, Falls Church, Va.
E-13 on Absorption Spectroscopy	E. J. Rosenbaum, Sun Oil Co., Norwood, Pa.	*R. F. Robey, Esso Laboratories, Standard Oil Development Co., Linden, N. J.
E-14 on Mass Spectrometry	*M. J. O'Neal, Shell Oil Co., Houston, Tex.	*Arthur B. Kent, Sun Oil Co., Marcus Hook, Pa.

Abstracts of Porcelain Enamel Committee Reports

***Editor's Note.*—ASTM Committee C-22 on Porcelain Enamel, through its Subcommittee on Research, has prepared a number of reports originally intended as a guide for the activities of the committee, particularly in the development of standard methods of test by the proper subcommittees. The committee has been alert to the value of disseminating technical information, not only to the committee members but to the industry as a whole. It is with this in mind that two reports representing reviews of literature on particular subjects have been abstracted for the ASTM BULLETIN, as well as for other journals of the industry. Copies of the unpublished manuscripts are available from ASTM Headquarters.**

Review of Tests for the Estimation and Measurement of the Adherence of Porcelain Enamels and Ceramic Coatings to Iron, Steel, and Other Metals

By L. S. O'Bannon[1]

The importance of adherence in porcelain enameling, glass-to-metal seals, and other applications involving the joining of ceramic materials and metals long has been recognized. This is attested by the fact that nearly 350 papers have been published in which the adherence of porcelain enamels and ceramic coatings to metals is discussed. Many of these papers have dealt with hypotheses to explain adherence, but none has received universal acceptance. Attempts to develop satisfactory tests for the measurement of this property, therefore, have been greatly handicapped.

For the most part, the tests employed as a measure of this property have been in some manner destructive. Many of these tests have involved a form of impact, such as, for example, the pendulum or the falling weight. Other tests have been employed in which the coated metal is subjected to bending or other types of deformation, but without impact. Another group of tests has been used in which coated laboratory specimens of special design are subjected to tensile or to compressive stresses to measure the force required to remove the enamel from the metal base. Miscellaneous tests involving microscopic examinations, electrical measurements, and the like also have been proposed, but these have not been used widely.

It should be pointed out that some of the tests discussed in the literature and which are included in this report, were designed for the measurement of some property other than the actual bond or the bonding strength of the enamel to the base metal. Some of these are identified as tests of the resistance of the enamel to chipping, the strength of the enamel coating, the toughness of the enamel, the resistance of the coating to repeated blows, and the hardness of the enamel, and possibly as an indication of the fit of the coating to the base metal. Inasmuch as many of these properties are closely related, they may not be divorced completely from adherence on the basis of present knowledge, and their inclusion in consideration of tests for adherence appears to be justified.

The shortcomings of tests of the destructive type, of course, are well known. The optimum test for manufacturers, distributors, and consumers of porcelain-enameled and ceramic-coated ware would be one which permits actual measurement of adherence on the ware as it is shipped. In the case of the destructive tests, however, the measurements necessarily are made on a proxy basis; that is, ware released for shipment is assumed to have good adherence on the basis of tests on specimens which presumably are subjected to the same conditions of manufacture.

The various types of tests which have been developed and tried over a period of more than 40 years are described. Impact tests, deformation tests, bending tests, torsion tests, compression tests, tensile tests, kinetic tests, electrical tests, and microscopic tests are mentioned. A bibliography of 70 items is enclosed.

[1] Battelle Memorial Institute.

Gas Evolution Effects Associated with Steel, Enamel, and Enamel Processing

By B. J. Sweo[1]

The material summarized briefly in published information relating to gas evolution effects is associated with steel, enamel, and enamel processing which contribute to defects in porcelain enamel applied to steel. A bibliography comprising the more pertinent references is appended.

The gases evolved, as indicated by the literature, are (1) gases from steel; (2) gases from enamel; and (3) gases from processing. Gases from processing are further subdivided into pickling, drying, and firing gases. The principal sources of the gases evolved are listed, these gases being hydrogen as reported present in steel; oxidation of carbon; hydrocarbon gases such as methane formed by action at high temperatures of hydrogen on carbon or carbon compounds in steel; water from several sources; chlorine from vapor degreasing operations; and sulfur from several sources, the major source being fuel.

Enamel defects resulting from the various gases are reported to be as follows:

Hydrogen causes fishscaling, reboiling, copperheading, blackspecking, and blisters.
Carbon monoxide causes blisters.
Carbon dioxide causes blisters.
Water causes fishscaling, reboiling, copperheading, blackspecking, blisters, and tearing.
Chlorine causes copperheading, blackspecking, and blisters.
Sulfur gases cause scumming, tearing, blackspecking and blisters.

[1] Ferro Enamel Corp.

Electrocuting Ships

MANY ships of the National Defense Reserve Fleet are being saved from corrosion by an "electrocution" process devised by General Electric engineers.

The new process actually does electrocute the ships in a mild sort of way. Direct current from electrodes buried in the mud along the shore passes through the water to the underwater sections of the ship hulls. This makes the hulls part of an electric circuit and causes an electrochemical reaction which prevents the hulls from corroding and results in the electrodes rusting away instead.

Previously, ships had to go into drydock every three years for scraping, refinishing, and painting. Now they can be left in the water, saving the Government an estimated $1500 per ship per year.

—*General Electric News Digest*

Random Samples . . .

FROM THE CURRENT MATERIALS NEWS

From the broad stream of current materials information flowing from "in-box" to "out-box" in a busy editorial office, random samples (mostly random) have been plucked. Thinking them worth re-showing to ASTM'ers who may have missed the original articles, we have included them here. Of course, we had to trim the samples to fit. There will be those who are not satisfied with samples, especially ones which are not really random. But these ASTM'ers can contact the institution, magazine, governmental agency, etc., who placed the original information in the stream. We have quoted literally, sometimes without quotation marks where the point of omission is obvious, and we have given credit to the source. These credit lines are also for the use of ASTM'ers whose entire curiosity has been aroused.

Barging Ahead

VENEZUELA is flaring or burning 85 to 90 per cent of the natural gas produced in its oil fields because no market comparable to the United States exists in Venezuela for this energy source and chemical raw material. Saudi Arabia and the surrounding regions comprise the greatest known oil reservoir in the world today. Associated with this vast oil pool are untold quantities of natural gas that, because of location, have no feasible use. Some is being pumped back into the wells to maintain the pressure that forces the oil to the surface but the rest must be flared or burned, as in Venezuela. Six hundred million cubic feet of natural gas is being flared every day in the Middle East fields, about 15 per cent of the amount used for residential heating in the United States in 1953.

A new approach to the recovery of this wasted natural resource is now being taken according to the *Industrial Bulletin* of Arthur D. Little, Inc. It is proposed to liquefy the natural gas at the fields and transport it in specially designed and equipped barges for U. S. pipelines and markets. One such barge is now being built to carry liquefied gas from Louisiana gas fields up the Mississippi to customers in the Chicago area. If this pilot operation is successful, it may lead to more widespread use. While the problems of transporting liquefied gas are complex, the project is being closely followed by the Foreign Operations Administration, the World Bank in Washington, and others, as a possibility for future shipment from foreign sources.

The barge now under construction will have heavily insulated storage tanks. Some of the liquefied gas will be vented during transit; these vapors will be collected and used as fuel to drive the tow boats. Facilities for regasification of the bulk of the cargo are planned at the destination. Circulating warm brine may be used for this regasification, and since natural gas at atmospheric pressure is liquid at −258 F or lower, the brine will be chilled enough to be useful as a refrigerant, thus recovering some of the cost of the original liquefaction. Refrigeration requirements for frozen foods, meat packing and fish processing plants may be doubly served by using liquefied natural gas, both as a refrigerant and as a source of power.

The use of barges might increase the flexibility of delivering natural gas to the consumer. Barges can reach coastal or river areas, such as eastern Canada and the northeastern states, where it is uneconomic to install pipeline facilities. Similarly, natural gas could be barged from fields with limited reserves that would not sustain the cost of a permanent pipeline facility.

The availability of fuel at relatively low cost might change radically the rate of industrialization in many countries, now held back by high-cost fuels. If the new technique proves successful, and economics are sound even in the absence of the specialized need for refrigeration, it may be possible to look forward to long-distance shipment of natural gas in larger ocean-going vessels.

•

That New Gasoline

THERE may not appear to be any connection between platinum, the precious metal, and our ability to obtain better performance from gasoline. However, a few cents worth of platinum is used in the production of each 42-gallon barrel of high octane gasoline by the new Ultraforming process described in American Cyanamid's *For Instance #64*. Ultraforming converts low-grade gasoline into high octane variety by the most efficient method available today. It is based on three major factors: new process techniques, new design of equipment, and improved catalyst. Platinum is the active ingredient of the catalyst.

Low-grade gasoline is converted into the high octane type by subjecting it to high temperature and pressure. Under these conditions the shape and structure of the gasoline molecules are changed into types which give greater power when we "step on the gas." It is fascinating to visualize the conditions inside the huge reactors of the Ultraforming process. Billions of gasoline molecules are driven into violent motion by the great heat; they pound against one another so furiously that some are broken down completely into coke and hydrogen, others are broken into fragments some of which recombine to form different structures, and still others are twisted or "cyclized" so that they change from straight chains to ring-shaped structures. How can such a chaotic condition be controlled to produce a large percentage of the desired type of molecule? At this point one of the marvels of physical chemistry steps into action—the catalyst!

Many metals such as platinum, silver, molybdenum, and nickel may serve as catalysts but the problem is to find the one which produces the greatest percentage of the type of molecule desired and which has long life under the grueling conditions. The catalyst produces order out of chaos by a mechanism which has defied lucid explanation. Apparently, only simple contact of the chaotic molecules with the surface of the catalyst is necessary. Since only surface contact is involved the catalyst must be distributed over a large surface area. Also, it is subject to deactivation by deposition of coke and by physical or chemical changes in the catalyst structure.

Before World War II conversion of low-grade gasoline to a higher octane type was accomplished with relatively low efficiency by the thermal "reforming" process. About 1940 better conversion and higher octane numbers were obtained with the "hydroforming" process using a molybdena-on-alumina catalyst. The Ultraforming process represents the last word in a "hydroforming" process of increased efficiency. It required extensive development work involving new platinum catalysts, equipment design, operating techniques and conditions, and it will go into large-scale operation this year.

The new process uses lower pressures than were feasible previously. Lower pressures require a more efficient and rugged catalyst—one that holds up well in activity throughout long operating cycles, and which, after deactivation, is restored readily to its original activity by the new Ultraforming regeneration technique. On the other hand, lower pressures mean greater yield of high octane gasoline. The new equipment provides an extra catalyst case for the three reactors in each unit. This insures practically continuous operation and avoids costly shutdowns for catalyst regeneration or replacement.

●

Titanium Rolls on

A LIGHTWEIGHT titanium alloy considered suitable as a replacement for steel in military weapons has been developed for the Ordnance Corps by Armour Research Foundation of Illinois Institute of Technology, Chicago. Use of the alloy in the manufacture of heavy weapons and tanks should greatly increase their mobility.

The alloy was developed during a program sponsored at the Foundation by the Watertown Arsenal laboratory, Watertown, Mass., which does much titanium research for the Army.

The plates of the new alloy fabricated by ARF engineers were heat treated and tested at Watertown and found to be "very promising."

The Watertown tests show that the titanium alloy is 40 per cent lighter than high-strength steel and is highly corrosion-resistant and has properties which compare favorably with those of steel used in manufacturing weapons.

Further tests must be made to assure that the alloy is as good as first tests indicate. But the alloy is considered by Ordnance as a potential substitute for steel in many ordnance components.

Another property determined by the Watertown tests is that the alloy shows tensile strengths up to 192,000 psi. This is approximately 42,000 psi stronger than any commercial alloy of titanium now being produced.

●

Imperfections and Impurities Are Useful

THE most useful crystals are imperfect. While the crystalline state is generally thought of as nature's prime example of perfect order, small-scale structural disturbances abound in almost all crystals. Arthur D. Little's *Industrial Bulletin* tells us that thanks to various types of imperfection in the crystal pattern, we have TV picture tubes, fluorescent lights, malleable metals, and present-day photographic film.

Perfect crystals are made up of atoms arranged in a definite pattern; when the regular geometry of the structure is disturbed, for any reason, the physical properties of the crystal are changed. If, for example, one part of the pattern is dislocated, the mechanical strength of the crystal is lowered. The shear strength of a metallic crystal depends on the number of simple dislocations in its structure; yield strength has been found to be similarly dependent on imperfections.

In many cases, imperfections are "built into" a crystal, to achieve a desired result, but the techniques involved may be delicate and costly. To make a transistor, the recently developed substitute for a vacuum tube, as little as one part in one billion of impurity is added to an otherwise pure crystal of germanium or silicon. Phosphors, the luminous materials used on clock faces and in fluorescent tubes, are similarly prepared. Since the phosphor manufacturing process was perfected 20 years ago, the industry has grown to an annual production of over 200,000 tons of these imperfect products. Photographic emulsions that allow pictures to be taken at short exposure times and at moderate levels of illumination date back still farther. Their effectiveness also depends upon crystalline imperfections.

One type of imperfection, due to "interstitial atoms," is responsible for luminescence. When zinc sulfide is heated with a small amount of another sulfide of a heavy metal—copper, for instance—foreign atoms are deposited here and there between the regularly arranged atoms of zinc and sulfur. The copper atoms upset the normal arrangement of the crystal just enough so that if light strikes the crystal, the copper atoms will first absorb it and then re-radiate. In the process, the copper atom releases an electron, which recombines almost immediately, radiating light as it does so. Since this fluorescent effect is almost instantaneous, a fluorescent light bulb will go out as soon as it is switched off. The fluorescent effect would not take place at all, however, if atoms of a foreign substance were not present as imperfections in the crystal.

The opposite effect to fluorescence, in a sense, is phosphorescence. If there are "holes" in a zinc sulfide crystal, caused by the occasional omission of a sulfur atom, these holes serve as electron traps. Some of the electrons freed by light striking the crystal will fall into these traps, and it will be some time before they can get out, recombine where they belong, and re-radiate. Consequently, the afterglow of phosphorescent crystals may last for some seconds, or even minutes. In practical use, this may still not be long enough; for example, the luminous hands of a bedside clock should be visible all night long. In such cases, radioactive materials are added to the phosphor to keep the process going.

Photographic emulsions containing pure silver salts are not highly sensitive to light; for practical use they are always sensitized. In so-called chemical sensitization, some kind of impurity is introduced into the crystal grains, which are usually silver bromide. During exposure of the film to light, the imperfections influence the trapping of electrons, thereby building up a "latent image." When the film is developed, it is these regions where the crystal structure has been changed substantially that are left behind to make the picture.

Film may be sensitized further by adsorbing a layer of a suitable organic dye on the surface of the silver bromide crystals. The usefulness of the dye also depends on impurities; the light energy they absorb is transmitted to the grains of the emulsion only if the light is of the desired wave length, or color. In such cases, the absorbed energy travels through the emulsion as if it were itself a particle; to carry the parallel further, the traveling bit of energy has been given a special name, "exciton." It was not until recently that this type of behavior was confirmed experimentally.

In the increasingly important field of solid-state physics, which has given us the transistor, imperfection phenomena are paramount. "Donor" impurities give up an electron to the crystal structure; "accepter" impurities take one away and leave a hole. It appears that both the electrons and the "holes" are free to wander about, making the crystal a semiconductor of electricity in which currents can be readily controlled and can themselves control other, far larger currents. For this reason, a semiconductor provided with suitable electrodes and wired into a circuit (that is, a transistor) can be substituted for a vacuum tube.

As research probes deeper into the crystal structure, even more subtle, but still useful, imperfections are found. "Phonons," minute vibrations of the crystal structure itself, also appear to migrate through the structure. These disturbances act as if they collided with the wandering electrons and holes—imagine, if you can, a little bundle of vibrations colliding with a hole! Finally, after a period of fruitful wandering through the crystal structure, an electron may encounter a hole, and end its useful life by recombining with it. Fanciful though the language may seem, it describes relatively well our imperfect knowledge of imperfections.

A Fatigue Testing Machine for Range of Stress

By James P. Romualdi, Chiao-Lin Chang, and Charles F. Peck, Jr.

A study of the effect of range of stress on the fatigue properties of rotating-beam specimens. A full range of loading from pure tension to pure bending in any combination can be obtained.

The testing machine described in this paper (Fig. 1) is capable of subjecting rotating-beam fatigue specimens to range of stress from complete stress reversal to pure tension at speeds of 1800 rpm. The machine is similar, in all essentials, to an earlier machine built at Carnegie Institute of Technology as part of a doctoral program of research in Civil Engineering by Chiao-Lin Chang.[1]

The machine is a constant load type in that it is statically determinate with respect to the loads producing bending and tension. Specimens can be easily prestressed in tension before being tested in fatigue and changes in loading can be made while the test is in progress. The chucks for holding the specimens are designed to eliminate the need for threaded specimens thus facilitating specimen machining procedure.

The machine has been calibrated for both static and dynamic operation and calibration data are summarized in tables and graphs. Working formulas and a nomographic chart bring the analysis of combined stresses into convenient form for use in the laboratory.

Description of Machine

Stresses are induced in the specimen by loads that produce tension and bending. Alternating stresses, varying from complete reversal to pure tension, can be developed by varying the magnitudes of the axial and bending stresses.

The schematic diagram of the testing machine is shown in Fig. 2. The shaft, or rotating beam, consists of the specimen; two chucks, C_1 and C_2; and the two shafts, S_1 and S_2.

The shaft is supported by the two bearing housings, H_1 and H_2, and driven by the motor D, through a flexible coupling. The housings, pivoted at P_1 and P_2, are free to rotate about axes perpendicular to the plane of loading. They are supported by two vertical tension arms, T_1 and T_2, attached to the main chassis by pivots, P_3 and P_4.

Bending stresses are produced in the specimen by the weight, W_1 that is connected to the arms, M_1 and M_2, by the nylon string, A_1. The vertical arms are securely fastened to the bearing housings. Since the housings are free to rotate about the horizontal pivots, P_1 and P_2, the bending moment due to the weight, W_1, is resisted solely by the specimen. The length of the moment arm is 12 in. and the mechanical advantage of the string and pulleys is two. Hence the bending moment produced in the specimen due to the weight W_1 is 24 W_1 (in-lb). Tests carried out

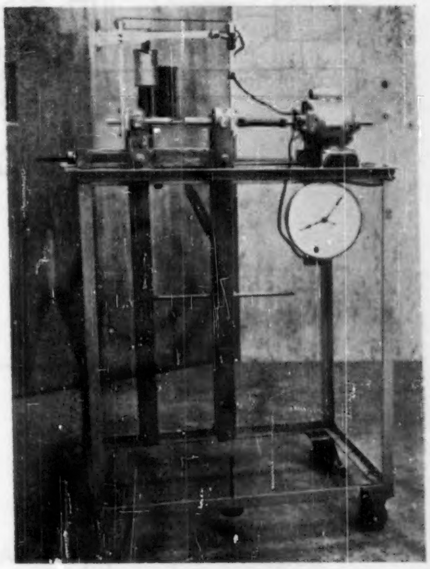


Fig. 1.—Fatigue Machine.

JAMES P. ROMUALDI is a graduate student at Carnegie Institute of Technology where, from 1951 to 1953, he was a Research Assistant on a study of the effect of range of stress and prestrain on the fatigue properties of titanium and its alloys.

CHIAO-LIN CHANG did his doctoral research at Carnegie Tech on the effects of range of stress and low temperature on fatigue of metals. He is now employed as a designer for George S. Richardson, Consulting Engineer, Pittsburgh.

CHARLES F. PECK, JR. obtained his Sc.D. in 1947 from MIT and is Assistant Professor of Civil Engineering, Carnegie Institute of Technology, where he has conducted research in the fields of fatigue and experimental stress analysis.

NOTE.—DISCUSSION OF THIS PAPER IS INVITED, either for publication or for the attention of the author. Address all communications to ASTM Headquarters, 1916 Race St., Philadelphia 3, Pa.

[1] Chiao-Lin Chang, "Effect of Range of Stress and Low Temperature on Fatigue of Metals—Background and Apparatus." Thesis submitted to the Department of Civil Engineering in partial fulfillment of the requirements of the degree Doctor of Science, Carnegie Institute of Technology, June, 1952.

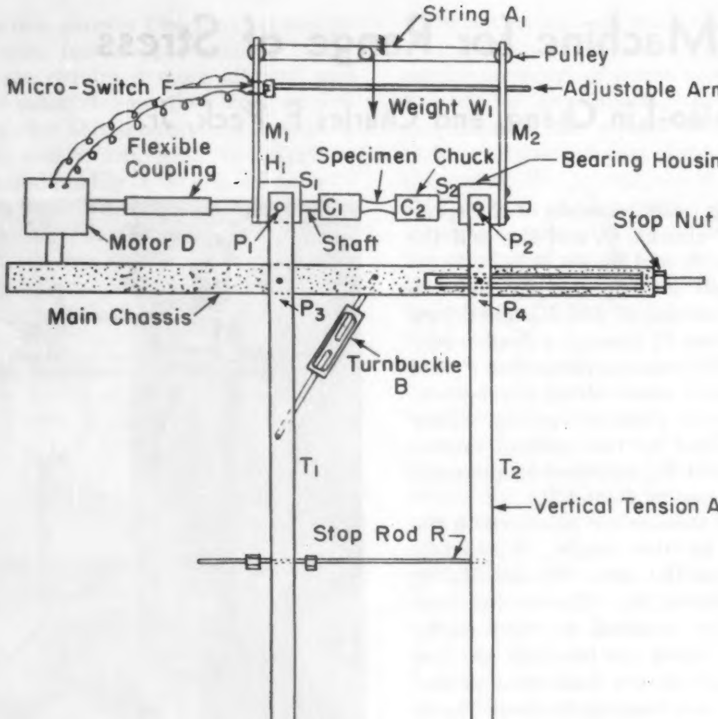


Fig. 2.—Schematic Drawing of Fatigue Machine.

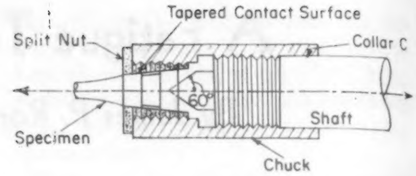


Fig. 3.—Section View of Connections of Specimens, Chuck, and Shaft.

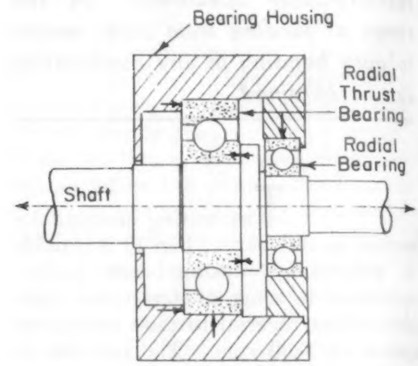


Fig. 4.—Section View of Bearing Housing.

on the machine show that the effect of the flexible coupling in offering resistance to this moment is negligible.

When the specimen breaks, the arms, M_1 and M_2, are drawn together bringing the adjustable arm, G, into contact with the microswitch, F, to shut off the motor. The arm, G, also prevents the specimen from striking the chassis after fracture.

Tension is applied to the specimen by the weight, W_2. Because the bar, T_2, is free to rotate about the pivot, P_4, the pull in the cable, A_2, is resisted by the tension in the specimen. This tension is transmitted to the arms through thrust bearings in the housings. The bar, T_1, is held fixed to the chassis by the turnbuckle, B.

The pivot, P_4, can be moved longitudinally along the chassis so that specimens of various lengths can be tested. After a specimen has been mounted, further movement of this pivot is prevented by the stop nut, E, that is drawn up tight against the chassis. The stop rod, R, checks the swing of bar T_2 after the specimen breaks, but it offers no resistance to movement of bar T_2 while the specimen is still intact.

The cable A_2 and the pulleys P_5 and P_6 form a system with a mechanical advantage of two; hence the force tending to draw the bottom of the arms T_1 and T_2 together is $2\,W_2$. The pivots, P_3 and P_4, divide the vertical tension arms into a ratio of 8 to 1 and, therefore, the tensile force in the specimen, due to the weight W_2, is $16W_2$ (lb).

The motor, $\frac{1}{2}$ hp, single phase, 115-v ac, 1800 rpm, and an electric clock are connected in series with the microswitch. Both motor and clock stop when the circuit is broken. The total number of revolutions that the specimen has undergone can be computed by multiplying the difference in time, in minutes, from the start of the experiment to fracture, by 1800 rpm.

Details of Construction and Design

The design of the chucks that are used to attach the specimen to the shaft was

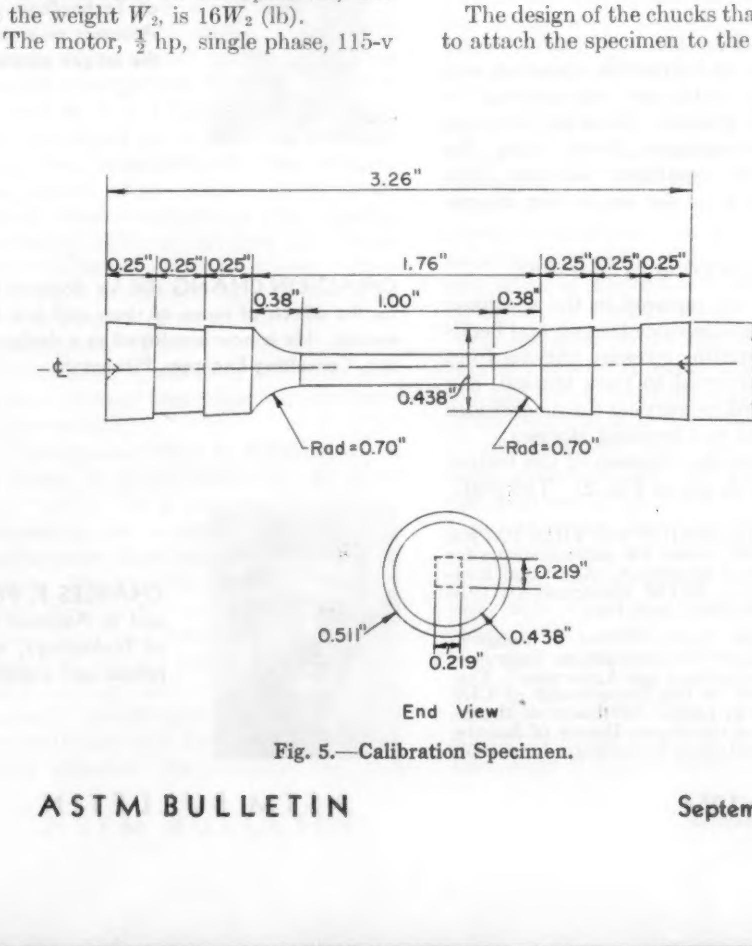


Fig. 5.—Calibration Specimen.

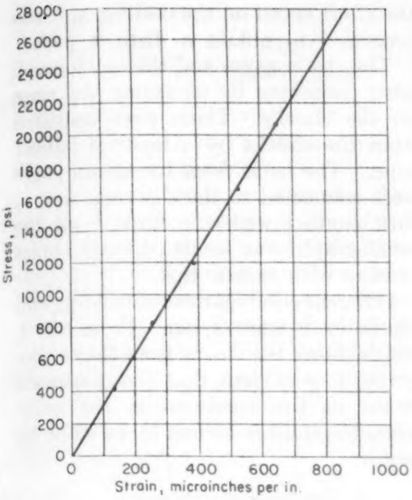


Fig. 6.—Stress-Strain Curve for Specimen Assembly.

based on the following considerations:

1. Specimens should be installed and removed readily. 2. Specimens must be in proper alignment during a test. 3. Threads should not be depended upon for longitudinal alignment.

The connection of specimen, chuck, and shaft is illustrated in Fig. 3. The chuck has a straight collar which is machined to fit the shaft beyond the threaded section. Thus when the shaft is pulled the alignment is not dependent on the threads but on the sliding collar. The specimen is tapered at both ends and is aligned in the chuck by an inside tapered split nut. The specimen is kept in place by the tensile pull through the assembly and the 60 deg center point on the shaft which bears on the specimen as shown.

Thrust is transmitted from the bearing housing to the shaft by a radial-thrust bearing in the housing. This arrangement is shown in Fig. 4. Moment is transmitted to the shaft by the radial reactions of the thrust bearing and a radial bearing. The reaction of these two bearings on the housing form a couple with a moment equal to the external moment exerted by the weight, W_1, and the arms, M_1 and M_2, of Fig. 2.

To avoid operating the machine through resonance, the natural frequency of the combined shaft and housing was made to be greater than the speed of operation by reducing the span length between the pivot points, P_1 and P_2, and by making the vertical arms and housings of aluminum. Cold-rolled steel was used at all rotating or pivoting joints. The pulleys and housings are designed to permit lateral adjustment. By means of the stop nut, E, the distance between the chucks can be adjusted to take specimens from $1\frac{1}{2}$ to 7-in. in length.

Calibration of Fatigue Machine

The machine was calibrated to determine whether appreciable dead load stresses were induced in the specimen when mounted and whether the dynamic effect of rotation produced significant variation in the stresses of the loaded specimen.

Figure 5 shows the calibration specimen, static and dynamic, which was subjected to both tests. A square specimen was used because of difficulty in mounting SR-4 strain gages on a round specimen of small radius. Two electric strain gages (SR-4, type A-7) were attached to two opposite faces of the specimen. Strain in the specimen was determined by means of strain-measuring apparatus.

The strain gages were first calibrated on the specimen which was subjected to loads in a standard testing machine. Tensile loads were applied to the specimen and chucks that were held by a ball and socket arrangement to insure axial

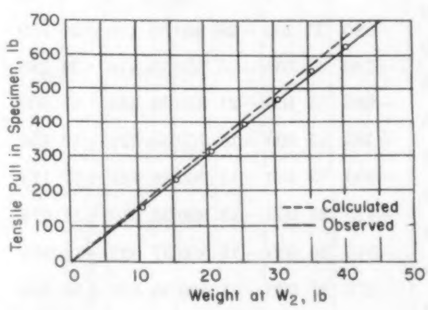


Fig. 7.—Results of Static Calibration Test in Pure Tension.

loading. Results of this test are shown in Fig. 6. An apparent modulus for the steel specimen assembly of 32.14 $\times 10^6$ psi was obtained. This modulus was used during the calibration tests to convert strain to stress for different applied loads on the machine.

The static tests were made with the specimen in pure bending, pure tension, and combined bending and tension.

The pure tension test was conducted by applying loads, W_2, (Fig. 2) in increments to a total load of 45.5 lb (including weight of hanger). The average strain for the two strain gages was converted to applied load by use of the apparent modulus. The tensile pull in the specimen is plotted as ordinate and the corresponding weight, W_2, as abscissa in Fig. 7. Both calculated and observed functions are plotted.

The pure bending test was conducted by applying loads W_1 (Fig. 2) until a total load of 3 lb was reached. This corresponds theoretically to a moment in the specimen of 72 in-lb. The average strain is converted to the applied bending moment by use of the apparent modulus and the flexure formula. Figure 8 shows bending moment as ordinate and corresponding weight, W_1, as abscissa. Both calculated and observed functions are plotted.

In combined bending and tension tests there is a counteraction between the tensile and bending loads. Thus the maximum and minimum stresses are given by:

$$S = T_0/A \pm \frac{8M'}{Ad} \quad \text{.......(1)}$$

where:

S = stress,
T_0 = total tensile force due to the applied load W_2 (Fig. 1),
M' = corrected bending moment in a specimen under combined and tension, and
A and d = area and diameter, respectively, of smallest section of round specimen.

The corrected bending moment is expressed as follows:

$$M' = \frac{M_0}{1 + 40T_0/EAd^2} \quad \text{.....(2)}$$

where:

M_0 = bending moment due to applied load W_1 (Fig. 1), and
E = modulus of elasticity of test specimen.

Substituting Eq 2 into Eq 1 the equation for the maximum and minimum stresses becomes:

$$S = T_0/A \pm \frac{8M_0}{Ad + 40T_0/Ed} \quad \text{..(3)}$$

Tests of combined bending and tension were conducted at a constant mean stress level and at varying mean stress levels. That is, for the first series of tests the tensile pull was held constant and the bending moment was varied. For the second series of tests a constant bending moment was applied and the tensile pull was varied. The results of these tests are shown in Tables I and II. In each test one gage was on

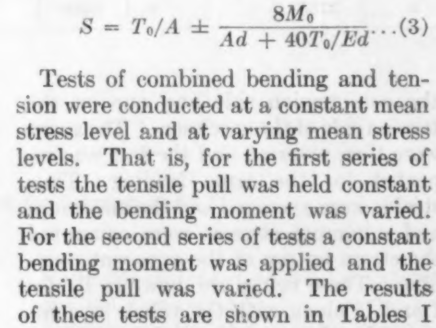


Fig. 8.—Results of Static Calibration Test in Pure Bending.

TABLE I.—CALIBRATION OF FATIGUE MACHINE—VARYING BENDING AT CONSTANT TENSION OF 380 LB.

M_0, in-lb	Maximum Strain, microinches per in.			Minimum Strain, microinches per in.			Observed Stress, psi		Calculated Stress, psi	
	Average	Difference	Sum	Average	Difference	Sum	Maximum	Minimum	Maximum	Minimum
0.....	3746		...	3660		...	0	0	0	0
		397			124					
10.....	4143		397	3784		124	12 720	3 980	12 832	3 052
		146			−149					
21.....	4289		543	3635		−25	17 400	−800	18 209	−235
		166			−163					
31.....	4455		709	3472		−188	22 750	−6 040	23 098	−7 214
		175			−172					
43.....	4630		884	3300		−360	28 400	−11 550	28 965	−13 081
		153			−152					
56.....	4783		1037	3148		−512	33 200	−16 400	35 320	−19 437
		177			−181					
68.....	4960		1214	2967		−693	39 000	−22 200	41 180	−25 300
		−1215			696					
0.....	3745		−1	3663		3	0	0	0	0

TABLE II.—CALIBRATION OF FATIGUE MACHINE—VARYING TENSION AT CONSTANT BENDING OF 56 IN-LB.

Tensile Force, T_0, lb	Maximum Strain, microinches per in.			Minimum Strain, microinches per in.			Observed Stress, psi		Calculated Stress, psi	
	Average	Difference	Sum	Average	Difference	Sum	Maximum	Minimum	Maximum	Minimum
0....	3755		...	3675		...	0	0	0	0
		1038			−820					
152....	4793		1038	2855		−880	33 200	−26 300	33 140	−26 789
		12			80					
228....	4805		1050	2935		−740	33 700	−23 750	33 816	−24 286
		23			75					
305....	4828		1073	3010		−665	34 400	−21 350	34 554	−21 800
		20			80					
380....	4848		1093	3090		−585	35 100	−18 750	35 321	−19 438
		12			90					
455....	4860		1105	3180		−495	35 400	−15 900	36 131	−17 113
		15			70					
535....	4875		1120	3250		−425	35 900	−13 600	37 040	−14 678
		21			80					
610....	4896		1141	3330		−345	36 600	−11 800	37 932	−12 434
		29			70					
685....	4925		1170	3400		−275	37 500	− 8 830	38 856	−10 224
		−1170			280					
0....	3755		0	3680		5	0	0	0	0

the compression side and one on the tension side of the specimen. The gages were then reversed and the test was repeated for the same loading. Thus strains were averaged and the maximum and minimum stresses were computed therefrom by use of the apparent modulus. These values are shown in Tables I and II along with the values as computed by the method developed above. Good agreement is noted.

Tests were conducted to determine whether there was any dynamic effect on the stress due to the rotation of the specimen and the vibration of the machines. For this purpose a plot of the strain in the specimen was obtained on an oscillograph. Strains were not measured quantitatively from the plotted curves since the machine had already been calibrated statically. Hence it it was only necessary to compare the peak readings on the curve, or the maximum strain, when the machine was turned slowly by hand and when it was rotated by the motor. When the machine was operated by the motor the chart speed on the oscillograph was increased to obtain a distinct plot.

The strain gages and the oscillograph were connected by mounting slip rings on the chucks. These were insulated from the chucks by a layer of rubber tape. The leads from the strain gages were connected to the slip rings and in turn contact with the leads from the oscillograph was made through brass brushes with carbon tips.

Different combinations of bending and tensile loads were tested. From Fig. 9, which shows the charts from the oscillograph, it is evident that the maximum strain in the specimen is the same when the shaft is turned by hand or by motor.

Operation Curves

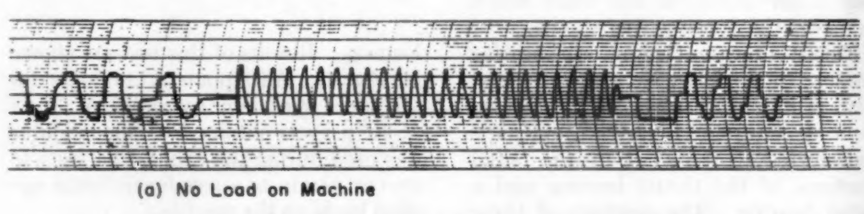
It is often desirable to conduct a series of tests for an S-N diagram at certain fixed values of r (ratio of minimum to maximum stress) when the specimens are being tested under combined bending and tension. Also, most established criteria for the construction of a range of stress diagram require values of the endurance limit at $r = -1$ and $r = 0$.

The formula developed for the corrected moment in combined bending and tension is:

$$M' = \frac{M_0}{1 + 40T_0/EAd^2} \quad \text{.......(2)}$$

The maximum and minimum stresses are given by:

$$S = T_0/A \pm \frac{8M'}{Ad} \quad \text{.......(1)}$$



(a) No Load on Machine

(b) $S_{max} = 32\,100$ psi $S_{min} = -19\,900$ psi

(c) $S_{max} = \pm 29\,000$ psi

Fig. 9.—Curves from Oscillograph Showing Strains in Specimen Under Repeated Loading.

and for a 0.25-in. diam steel specimen

$$S = 20.4T_0 \pm \frac{653M_0}{1 + T_0/2300} \ldots (4)$$

Thus for any combination of M_0 and T_0 the maximum and minimum stresses can be calculated directly.

In order to conduct a test at a fixed value of r, the values of M_0 and T_0 would have to be adjusted prior to the testing of each specimen. The use of Eq 4 for this would be laborious and time-consuming. To overcome this difficulty the chart, Fig. 10, and the nomograph, Fig. 11, have been prepared. Thus for values of r and S_{max} the resulting values of M_0 and T_0 can be readily determined.

Correction Factors

The numerical constants in Eq 4 are developed on the basis that the diameter of the specimen is 0.250-in. Table III shows correction factors which take into account small variations in the diameter of specimens as machined.

TABLE III.—CORRECTION FACTORS.

Diameter, in.	T_0	M_0
0.248.......	0.986	0.976
0.249.......	0.992	0.985
0.250.......	1.000	1.000
0.251.......	1.008	0.013
0.252.......	1.014	1.023

The factors are applied to the values of M_0 and T_0 that are to be substituted in Eq 3. Machining specifications allow a tolerance of ± 0.001-in.; hence, with the use of the correction factors, no appreciable error in the computed stress is introduced by small changes in the diameter of the specimen.

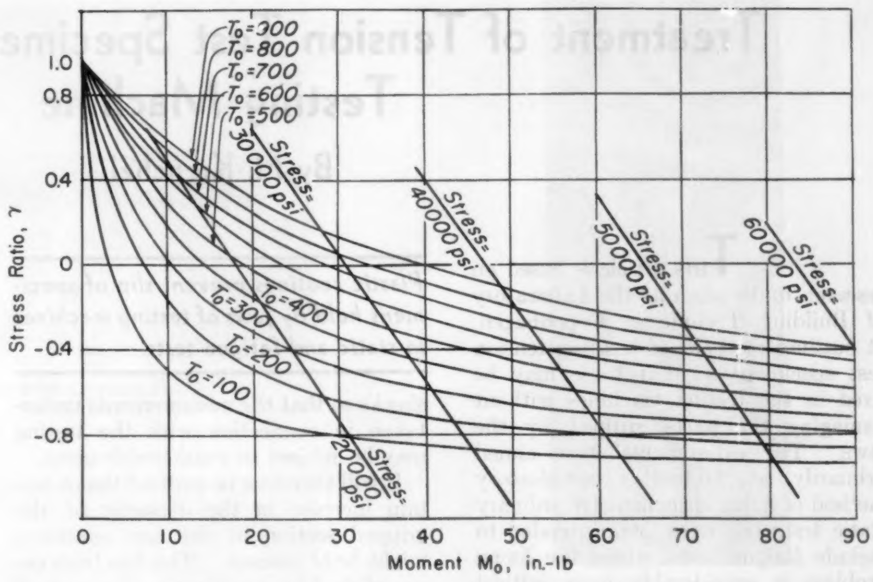


Fig. 10.—Curves of M_0T_0 Plotted Against Stress Ratio.

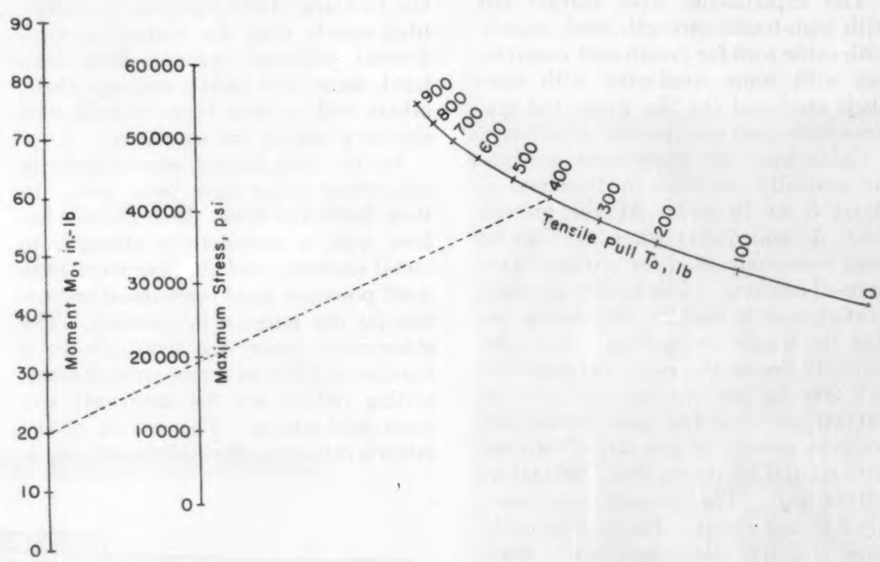


Fig. 11.—Nomograph for Solution of Eq 3.

Summary and Conclusions

Dynamic calibration tests showed that the limits of stress in the specimen rotated by the motor at 1800 rpm are the same as the limits of stress when the specimen is rotated slowly by hand. The static calibration tests showed:

1. That the calculated and observed stresses in pure bending and pure tension agree closely when the apparent modulus, as obtained from the strain gage calibration, is used.

2. That the calculated and observed stresses in combined bending and tension agree when Eq 3 is used to correct for the counteracting moment produced by the tensile load.

Operation curves involving M_0, T_0, r, and S_{max} were developed to facilitate testing procedure. Correction factors were determined to take into account slight changes in the diameter of the specimen. Ordinary machining tolerances, however, would maintain stresses within the limit of accuracy of the machines for range of stress tests.

The machine fulfills the desired functions and specifications called for in its design and is satisfactory for an investigation of the effect of range of stress on the fatigue properties of a metal.

Acknowledgment:

The machine described in this paper is similar in all respects to an earlier machine designed and built by Chiao-Lin Chang at Carnegie Institute of Technology. The original design and construction were done under the supervision of Charles F. Peck, Jr., Assistant Professor of Civil Engineering, and F. T. Mavis, Head of the Department of Civil Engineering.

Subsequently two similar machines were built and calibrated in connection with a research program on the effect of range of stress and prestrain on the fatigue properties of titanium for Office Chief of Ordnance under Contract DA-36-061-ORD-68 and the project was under the technical supervision of the Applied Mechanics Branch Watertown Arsenal Laboratories. This work was done by James P. Romualdi, Research Assistant, under the supervision of E. D'Appolonia, Associate Professor of Civil Engineering, who was project supervisor.

The authors wish to express their appreciation to the sponsoring agency for permission to publish this paper.

Treatment of Tension Test Specimens for Fixing in Testing Machine

By H. Krenchel

Plastic coatings prevent slip of specimens held by jaws of testing machines in static and fatigue tests.

THIS article is based on research undertaken at the Laboratory of Building Technic in Copenhagen. It outlines methods of treating tension test specimens so that these may be fixed in the testing machines without damaging the parts gripped by the jaws. The experiments were aimed primarily at finding a satisfactory method of fixing specimens for ordinary static tests but were later extended to include fatigue tests, where the fixing problem is considerably more critical because of the risk of notching with consequent rupture at these points.

The experiments were carried out with high-tensile-strength steel, mainly with cable wire for prestressed concrete, but with some conducted with saw-blade steel and the like where the systems developed also proved effective.

Cable wires for prestressed concrete are normally available in diameters of about 3 to 10 mm. At the present time, 5- and 7-mm wires seem to be most commonly used for ordinary prestressed concrete. The steel is specially treated and is usually cold-drawn, so that the tensile strength of 5-mm wire normally lies in the range between 150 and 200 kg per sq mm (200,000 to 300,000 psi) and the yield stress (0.2 per cent offset) in the range between 110 and 160 kg per sq mm (160,000 to 230,000 psi). The elongation is generally 2 to 6 per cent. For thinner cable wires and for cold-drawn blade steel, etc., the tensile strength may be as high as 220 to 250 kg per sq mm (300,000 to 350,000 psi).

It is easily understandable that materials of such strengths, with surfaces almost as hard as glass, will be rather difficult to fix directly in the jaws of the testing machines. In testing machines with finely serrated jaws of comparatively soft material, the wires will simply slide out even at low stresses, whereas with coarser and hardened jaws there will be the greatest risk of rupture in the gripped piece before failure occurs in the free length. Even in cases where it proves possible actually to obtain a rupture outside the jaws, minute slips during the testing may produce slight shocks so that the measurements undertaken in connection with the testing may be subject to considerable error.

It will therefore be realized that a certain increase in the diameter of the gripped section of the test specimen might be of interest. This has been accomplished by application of a coat of plastic glue of such a thickness that the concentrated stresses originating from the toothing of the jaws will be distributed evenly over the surface gripped. Several different systems have been tried, some with plastic coatings alone, others with various types of mild steel sleeves glued on the specimen.

For the experiments, several types of ethoxylene resins have been used. In their hardened state, these plastics adhere with a considerable strength to metal surfaces, and the hardened resin itself possesses good mechanical properties for the purpose in question. The ethoxylene resins are available in a number of different forms, some thermosetting (which are the strongest) and some cold-setting. The setting of the latter is caused by the addition of a hardening agent immediately before the glue is to be used.

As examples of the adhesive strength of the resins, it may be mentioned that, for glue joints between polished steel surfaces with the load applied at right angles to the joint, an adhesive strength of about 700 to 800 kg per sq cm (10,000 to 11,000 psi) has been reached for the thermosetting resins and about 250 to 300 kg per sq cm (3500 to 4500 psi) for the cold-setting types.

The cold-setting types must be used where even moderate heating of the steel before testing is not permissible, but, as the other types may set at as low a temperature as 130 C (265 F), these will no doubt, in the course of time, customarily be used because of their superior mechanical properties.

The only pretreatment of the steel specimens that is necessary before the plastic coatings are applied is a thorough cleaning of the surfaces to be glued. Rolling the surface or similar treatment in order to compress the material, as has previously been necessary for fatigue tests, may be entirely dispensed with.

The best results for practical use have been attained by means of the following systems:

1. *Cold-setting Coating:* A quickly applied coating, its normal setting rate is about 14 hr, but this may be reduced to about 10 min by heating to 95 to 100 C (200 to 210 F). Paste resin is used ("Araldit," type 121)[1] and is applied in a thickness of 0.5 to 1 mm over a length of 15 to 20 times the wire diameter. The coating may be made cylindrical before setting by a kind of extrusion process, the coated wire being drawn through an internally conical piece of pipe (Fig. 1).

This coating has proved very useful for ordinary static tests. In fatigue tests, however, or in static tests with long-time stressing, so much creep may

[1] Produced by Ciba Ltd., Switzerland.

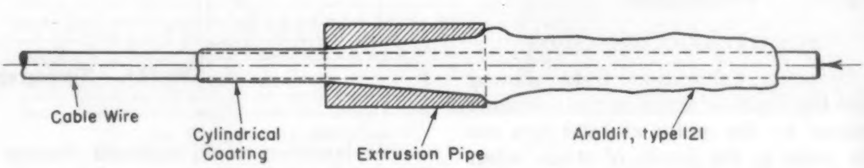


Fig. 1.—Extrusion Process for Coating No. 1.

H. Krenchel, after three years work in industry, is now employed by the Laboratory of Building Technic at the Danish Technical High School, where he is doing research on modern construction materials and systems.

NOTE.—DISCUSSION OF THIS PAPER IS INVITED, either for publication or for the attention of the author. Address all communications to ASTM Headquarters, 1916 Race St., Philadelphia 3, Pa.

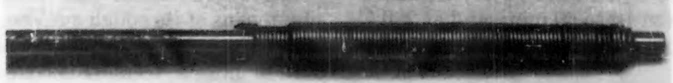


Fig. 2.—7-mm Cable Wire with Coating No. 2.

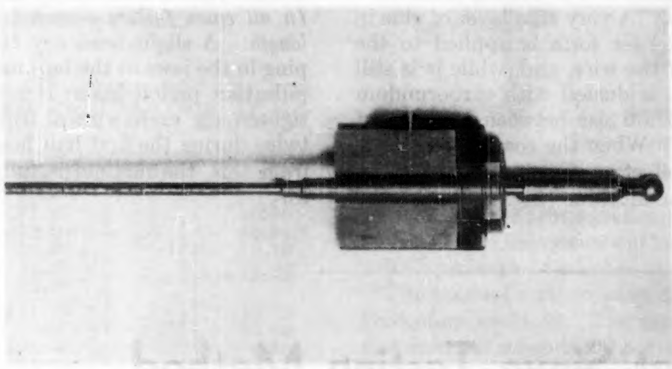


Fig. 3.—Test Piece Shown in Fig. 2 Placed in the Jaw of the Testing Machine.

Fig. 4.—Coating No. 4.

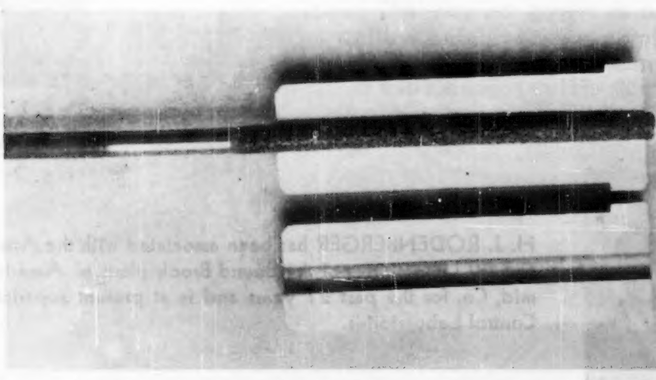


Fig. 5.—Carborundum-Coated Test Piece in Semicylindrical Jaws of Mild Steel

Fig. 6.—5-mm Cable Wire Tested in the High-Frequency Fatigue Testing Machine.

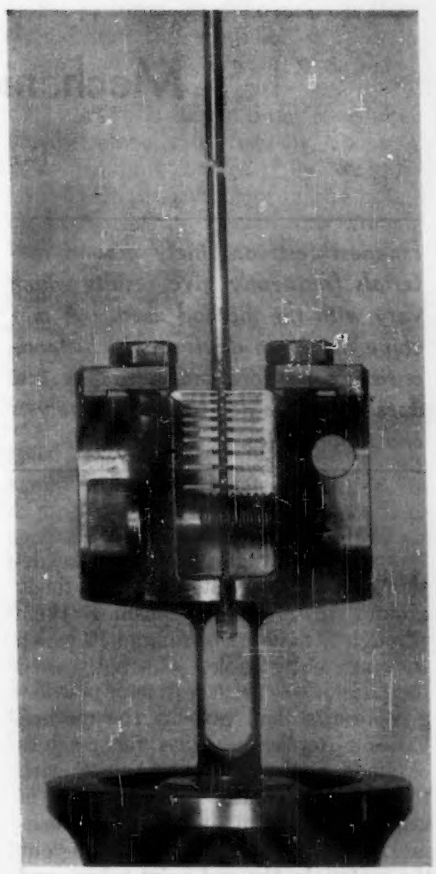


Fig. 7.—Close-up of Broken Test Rod in Testing Machine.

occur in the plastic that one of the following systems will be preferable.

2. Cold-setting Coating with Wire Winding: Although somewhat more complicated than system 1, this type of coating is much stronger and has the same setting rates.

In this procedure the same resin is used as in the first system but outside it a tight winding of approximately 1 mm soft iron wire is applied (Fig. 2). After the glue has set, this winding offers a good surface for the grip of the jaws of the testing machine, and the distribution of shearing forces over the entire coated surface apparently is much better (Fig. 3).

3. Thermosetting Coating: The thermosetting resins are available in liquid, paste, and solid forms. All types may be used. The first two types are applied directly to the surface of the steel; the solid resin, which is available either as a powder or in bars, is melted onto the steel specimen after the latter has been heated to 140 to 150 C (285 to 300 F).

The setting rates are greatly dependent on the temperature and are: at 130 C (265 F) at least 10 hr; at 220 C (430 F) from 10 to 60 min; and at 280 C (540 F) a minimum of 3 and a maximum of 5 min.

Even a coating with a thickness of 0.1 to 0.2 mm (0.005 to 0.01 in.) and a length of 10 to 20 times the wire diameter may here be sufficient.

The plastic coating may also be used alone or with a wire-winding as described in procedure 2, but the best results are obtained by means of the following system.

4. Thermosetting Coating with Carborundum: A very thin layer of glue in bar or powder form is applied to the surface of the wire, and, while it is still sticky, it is dusted with carborundum powder (grain size between No. 70 and No. 150). When the coating has set it offers an effective gripping surface to the jaws of the machine (Fig. 4).

By this system, it is possible to fix the wire in semicylindrical jaws entirely unserrated, made of ordinary mild steel. This method probably should be considered as ideal, because the wire itself, by means of its rough surface, bites into the softer material of the jaws (Fig. 5).

For fatigue tests, this coating is definitely preferable. The grip is exerted directly on it by the normal jaws of the machine, which are drawn tight according to usual procedure. In this laboratory a rather comprehensive testing program has been carried out with 5-mm cable wires, all provided with carborundum coating. The wires were pulsated in an Amsler 10-ton high-frequency fatigue testing machine (Figs. 6 and 7). *In all cases failure occurred in the free length.* A slight tendency toward slipping in the jaws at the beginning of each pulsation period made it necessary to tighten up each wire a trifle once or twice during the first half hour. Apart from this, the method is fully satisfactory.

Mechanical Wet Sieve Testing Method

By J. J. Kobliska and H. J. Rodenberger

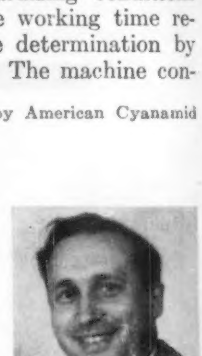
Fineness tests on finely ground materials frequently give results which vary with the method used. A machine has been devised which standardizes conditions and will make test data comparable between analysts and laboratories.

It is customary to determine mesh test data on certain finely ground materials by washing them through a sieve with a liquid in which they are not soluble. Currently used methods of wet mesh testing of powders give results that vary as the method varies. Replicate values for residues obtained on the same sample vary with the water-flow rate, type of spray of water, the amount and type of brushing, method of dispersing or wetting out the materials, the end point taken, and finally how diligently the analyst works to make the particles go through the sieve.

Perhaps the most difficult variable to overcome by these methods is the lack of a clearly defined end point. Since many materials have some appreciable solubility, by continued washing many particles will dissolve sufficiently to pass through the sieve, and by attrition many other particles will also pass through.

A mechanical testing device[1] has been designed to eliminate most of these variables by standardizing conditions and to decrease the working time required to make the determination by about 75 per cent. The machine con-

[1] Patent applied for by American Cyanamid Co.



J. J. KOBLISKA has a B.S. in chemistry from St. John's University and has been employed by American Cyanamid, Bound Brook, N. J. since 1946 as a chemist.

H. J. RODENBERGER has been associated with the Analytical and Control Laboratories of the Bound Brook plant of American Cyanamid, Co. for the past 27 years and is at present superintendent of Control Laboratories.

NOTE.—DISCUSSION OF THIS PAPER IS INVITED, either for publication or for the attention of the author. Address all communications to ASTM Headquarters, 1916 Race St., Philadelphia 3, Pa.

sists of a rotating platform upon which a single sieve can be placed. A flattened stream or sheet of water is directed on the screen in such a manner that the stream covers half the diameter of the sieve as it rotates. The sheet of water is directed at an angle so that the particles pass under it on each revolution of the sieve. The sieve is rotated and the water is passed through at a specified and controlled rate for a specified time. Since the operation is entirely mechanical, the results will not be subject to bias on the part of the operator.

The values in Table I afford a comparison of the percentage of residue on a No. 325 sieve obtained by the mechanical and manual[2] methods on a single sample of water-insoluble pigment.

TABLE I.—COMPARISON OF PER CENT RESIDUE RETENTION BY MECHANICAL AND MANUAL METHODS.

Analyst	Mechanical	Analyst	Manual
1..	11.47	3...	10.36
	12.00		10.71
	12.07		10.18
	12.00		Avg 10.42
	12.28	4...	10.62
	Avg 11.96		10.22
2..	11.48		9.80
	11.70		Avg 10.21
	12.02	5...	12.15
	11.72		13.91
	12.20		13.90
	11.96		Avg 13.32
	Avg 11.85	6.....	13.90
		7.....	12.10
		8.....	15.70
		9...	9.93
			7.68
			Avg 8.81
		10...	10.58
			11.94
			Avg 11.26

The mechanical method gave an average percentage of residue of 11.90. The experimental standard deviation is 0.26 per cent. The 95 per cent confidence value for the maximum possible standard deviation is 0.42 per cent.

[2] ASTM Standard Methods of Test for Coarse Particles in Pigments, Pastes, and Paints (D 185–45), 1952 Book of ASTM Standards, Part 4, p. 180. Modified to wash material on the sieve for 30 min.

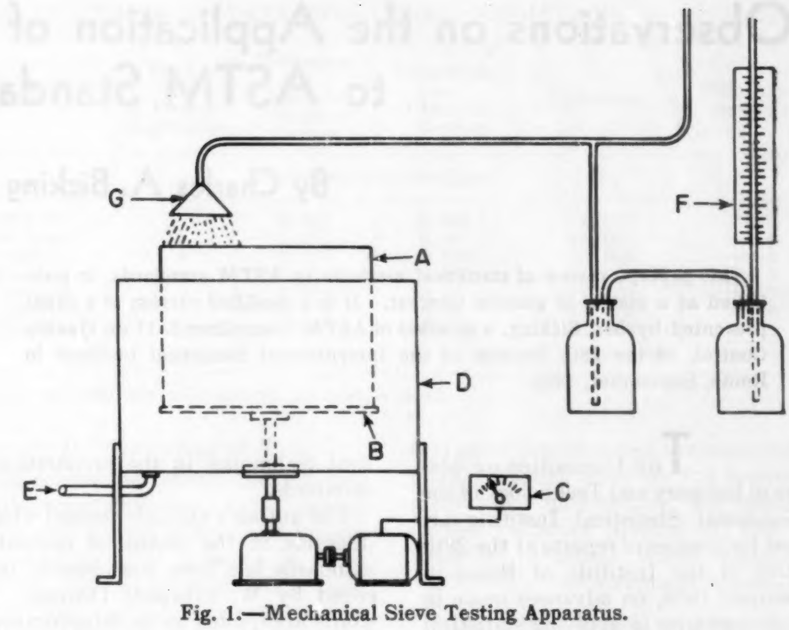


Fig. 1.—Mechanical Sieve Testing Apparatus.

Thus the 95 per cent confidence limit for 95 per cent of the errors will be less than ±0.82 per cent.

The manual method gave an average percentage of 11.48. The experimental standard deviation is 2.0 per cent. The 95 per cent confidence value for the minimum possible standard deviation is 1.55 per cent. From this experiment, it can be concluded with 95 per cent confidence that 95 per cent of the errors will be included in a range of not less than 3.02 per cent.

Assuming that the variability due to weighing and preparation of the sample and drying and weighing of the residue are insignificant, it can be concluded from the above data that it was not due to chance that analysts who used the mechanical sieve testing apparatus had little or no bias in their results. Working time for the manual method is about 30 min and for the mechanical method about 15 min.

The Mechanical Method:

Details of the mechanical method and apparatus shown in Fig. 1 are as follows:

The weighed sample is first pasted with a suitable wetting agent to insure dispersion. Then a measured amount of water is added and the slurry is stirred at a definite rate (high speed) for a definite time. The slurry is transferred to a U S Standard sieve, *A*, which rests on the platform, *B*. The motor is then started and the speed of rotation is regulated at about 20 rpm by means of a rheostat, *C*.

The water is turned on at a definite, predetermined rate (usually about 4 liters per min) controlled by the calibrated mercury column, *F*. The basin, *D*, catches the water and drains through the outlet, *E*. The sheet of water, *G*, is directed on the sieve so that it covers slightly over half of its diameter. The apparatus is allowed to run for a definite time (15 min for most materials) and is then shut off. The residue is dried and weighed in the usual manner.

A modification of the apparatus has been suggested by F. C. Stein,[3] which would allow camel's hair brushes to be clamped above the sieve in such position that the material is lightly brushed as the sieve rotates.

Acknowledgment:

The authors gratefully acknowledge the assistance of H. Van Blarigan and William Seaman in the preparation of this paper.

[3] Bakelite Corp., Bound Brook, N. J.

Observations on the Application of Statistical Techniques to ASTM Standards

By Charles A. Bicking

This paper, a review of statistical methods in ASTM standards, is published as a matter of general interest. It is a modified version of a paper presented by Mr. Bicking, a member of ASTM Committee E-11 on Quality Control, at the 28th Session of the International Statistical Institute in Rome, September, 1953.

The Committee on Statistics in Industry and Technology of the International Statistical Institute arranged for a series of reports at the 28th meeting of the Institute at Rome in September, 1953, on advances made in various countries in applying statistical techniques to standardization of industrial products. In preparing a report for the United States, the author made a reasonably complete survey of ASTM standards. Those parts of the complete report* which are considered to be of most interest to members of the American Society for Testing Materials have been abstracted in this paper. A complementary paper, to be published in *Industrial Quality Control*, concentrates on results achieved by groups outside the ASTM.

The purpose of the report made at Rome was to present a factual account of the trend toward more sophisticated statistical usages in the standards in the United States. Although the presentation was noncritical, the ASTM examples, in particular, were so chosen as to show a gradually increasing awareness of the need for more explicit statistical treatment of data and for clearer definition of terms. Brief comments on the adequacy of the statistical provisions of the examples have been added in this paper.

There are two general observations arising from the preparation of the Rome report that are worth making:

1. By and large, those involved in the writing of standards are well aware of the need for better statistical data and are appreciative of constructive criticism.

2. The standardizing agencies in the United States appear to be ahead of their European counterparts in their understanding and use of modern statistical techniques in the preparation of standards.

The author's attitude toward what is desirable in the statistical content of standards has been considerably influenced by W. Edwards Deming. His words are quoted as an introduction to the examples that follow:

"Standardization is largely a statistical problem, as good design of experiment and good sampling are necessary in order to derive the best answers, under conditions of actual service, for the sizes, qualities, and terms on which to standardize.

"A standard has no meaning unless an article can be tested by methods that have statistical stability (that is, show a state of statistical control), are not too costly, and are reliable in the statistical sense."

ASTM Standards

Many ASTM committees have subcommittees interested in the statistical aspects of testing or of specification. Still others carry on more or less statistical work on an informal basis. Some of this work shows a very rudimentary approach to a sound statistical basis and some is quite refined.

Committee E-2 on Emission Spectroscopy:

The test methods issuing from this committee indicate a recognition of the importance of the statistical background of measurement and include clauses defining criteria of precision and accuracy. The following examples are methods which have increasingly satisfactory definition of the statistical criteria of testing:

Tentative Method for Spectrochemical Analysis of Aluminum and Aluminum-Base Alloys by the Point-to-Plane Spark Technique (E 101-53 T)[1]

"Precision and Accuracy

"13. (*a*) The reliability of this method has been studied in a large number of cooperating laboratories and found to be satisfactory for most routine purposes. The precision of the method is such that coefficients of variation ranging from 2 to 4 per cent are obtained at concentrations above 0.50 per cent in repeat tests on the same material. Higher coefficients may be expected at low concentrations when weak lines are obtained, or when, as is usually the case, exposure conditions are adjusted to favor higher constituents.

"(*b*) Aside from precision, the accuracy of this method depends largely on the quality of the standards used and the degree to which those standards resemble the samples both chemically and physically. Errors amounting to several per cent of the concentration determined may be introduced by comparing samples and standards of marked physical dissimilarity, as, for example, in analyzing sheet products by comparison with cast standards. In the analysis of chill-cast disks with commercially available cast standards, the accuracy of the method becomes virtually equivalent to the precision as stated in Paragraph (*a*)."

Suggested Method for Spectrochemical Analysis of Nickel Sheet by the Point-to-Plane Spark Technique (E-2 SM 5-5)[2]

"5. Precision

"In order to give some measure of the repeatability of the method, coefficients of variation are given in Table II, although only a relatively small number of data are available for their calculation.

CHARLES A. BICKING, Chief, Design of Experiment Unit, Research and Development Div., Office, Chief of Ordnance, is vice-chairman of Committee E-11 on Quality Control of Materials. He has, for a number of years, dealt with problems of standardization in industry and recently, with standardizing activities of the Armed Services.

NOTE.—DISCUSSION OF THIS PAPER IS INVITED, either for publication or for the attention of the author. Address all communications to ASTM Headquarters, 1916 Race St., Philadelphia 3, Pa.

* "The Application of Statistical Techniques to the Standardization of Industrial Products".

[1] Issued as a separate reprint.

[2] Methods for Emission Spectrochemical Analysis, Am. Soc. Testing Mats., p. 68 (1953).

TABLE II.—DATA ON PRECISION OF METHOD.

Element	Coefficient of Variation[a]	Number of Determinations
Manganese	2.3	28
Titanium	2.5	27
Iron	3.3	28
Magnesium	4.0	15
Copper	5.0	21
Silicon	5.6	19

[a] Coefficient of variation, v, in this method, is calculated as follows:

$$v = \frac{100}{C}\sqrt{\frac{\Sigma d^2}{n}}$$

where:
C = average concentration, in per cent,
d = difference of the determination from the mean, and
n = number of determinations.

"6. **Accuracy**

"The percentage deviation of the results obtained by spectrochemical analysis from those obtained by chemical methods is accepted as a measure for the accuracy of the spectrochemical method. A comparison of the results of the spectrochemical and chemical analysis of nickel sheet, 0.002 in. in thickness, is shown in Table III."

TABLE III.—COMPARISON OF THE RESULTS OF SPECTROCHEMICAL AND CHEMICAL ANALYSIS.

Element	Spectrochemical Analysis, per cent	Chemical Analysis, per cent
Manganese	0.19	0.196
Iron	0.12	0.120
Silicon	0.02	0.022
Copper	0.06	0.051
Magnesium	0.037	0.037
Titanium	0.022	0.020

Suggested Method for Spectrochemica Analysis of Nickel Alloys by the Dry Powder–D-C Arc Technique (E-2 SM 5-1)[3]

"5. **Precision and Accuracy**

"The data shown in Table II indicate the accuracy of the procedure, as compared to routine chemical methods, on a number of samples. Some of the chemical values were rounded off to one significant figure, so the accuracy in some cases may be better or worse than indicated. The average percentage deviation from the chemical values is about ±5.5 for copper, iron, magnesium, manganese, silicon, and titanium. No data have been obtained on the accuracy of this procedure for the determination of aluminum, boron, cobalt, chromium, lead, and zinc, but the precision is of the same order of magnitude as for the other elements. The data were obtained... without plate calibration."

TABLE II.—DATA ON ACCURACY OF METHOD.

Sample	Number of Determinations	Percentage by Spectrochemical Method	Percentage by Chemical Method	Difference	Difference, per cent[a]
Determination of Iron					
S-64 cathode	8	0.063	0.063	0.000	0.0
S-65 cathode	8	0.051	0.05	+0.001	+2.0
S-66 cathode	4	0.067	0.062	+0.005	+8.1
J-54 (soln.)	4	0.056	0.060	−0.004	−6.6
D-70 cathode	4	0.074	0.07	+0.004	+5.7
D-71 cathode	4	0.076	0.07	+0.006	+8.6
No. H1400	8	0.036	0.033	+0.003	+9.1
				Average:	±5.4

[a] Average difference, all elements, per cent = ±5.5.

Committee D-19 on Industrial Water:

This committee follows the practice of publishing supporting data relating to new and revised methods of testing as appendices to its reports. In some instances, there is given simply a table of all the individual measurements made, identified by source. In other instances, the original measurements are supplemented by averages, standard deviations, and precision statements. A typical example follows from Supporting Data and Literature References Relating to New and Revised Methods of Testing Industrial Water.[4]

"*Supporting Data for Non-Referee Method A:*

"Data on the accuracy of Non-Referee Method A appears in papers by J. D. Betz and C. A. Noll. Precision data for Non-Referee Method A were obtained from four different waters, using two operators."

The precision and accuracy statement of Tentative Method of Test for Hardness in Industrial Water (D 1126 – 53 T),[5] relating to Non-Referee Method A, is as follows:

"**Precision and Accuracy**

"17. (*a*) Results for the total calcium and magnesium hardness and for the calcium hardness should be reproducible to within 0.1 ppm or 1 per cent of the amount present, whichever is the greater.

"(*b*) The method is accurate to within 0.04 ppm or 1 per cent of the total hardness present, whichever is the greater, in the absence of interfering ions in excess of the amounts shown in Table I (*not reproduced*) and in the hardness range of 0.10 to 24 ppm. The method is accurate to within 0.004 ppm of the total hardness present in the absence of interfering ions in excess of the amounts shown in Table I and in the hardness range of 0 to 0.10 ppm. The determination of calcium hardness is accurate to within 0.04 ppm or 2 per cent of the calcium hardness present, whichever is the greater."

Most new methods and revisions emanating from Committee D-19 contain some precision and accuracy statement, although some do not convey a great deal of information. For example, in the Tentative Method of Test for Odor of Industrial Waste Water (D 1292–53 T),[6] the statement is simply:

"The precision and accuracy of this method depend on the material producing the odor, and on the physical condition, experience, and skill of the operator."

Although the clarity of the precision and accuracy statement in the Tentative Method of Test for Hardness in Industrial Water may leave something to be desired, it is a decisive improvement over the statement in the Tentative Method of Test for Odor of Industrial Waste Water. Similarly, although the data of Table V suggest that a real measure of precision is not possible for the data presented because of the numerous duplications in the readings, nevertheless, the fact that the original data have been published at all represents some kind of a triumph for the proponents of statistics.

TABLE V.—DETERMINATION OF TOTAL HARDNESS BY NON-REFEREE METHOD A OF METHOD D 1126—PRECISION STUDY.

Sample No. 1—Diluted Cleveland City Water	Total Hardness, ppm $CaCO_3$	
	Analyst A	Analyst B
1	29.5	29.8
2	29.5	29.5
3	29.4	29.8
4	29.3	29.4
5	29.4	29.2
6	29.5	29.4
7	29.4	29.2
8	29.5	29.3
9	29.4	29.2
10	29.5	29.2
Average	29.44	29.40
Standard deviation$_{10}$	0.06	0.22
Standard deviation$_{20}$	0.17	
Precision = 0.57 per cent of hardness present		

[3] Methods for Emission Spectrochemical Analysis, Am. Soc. Testing Mats., p. 48 (1953).

[4] Appendix I to Report of Committee D-19 on Industrial Water, *Proceedings*, Am. Soc. Testing Mats., Vol. 53, p. 470 (1953).

[5] 1953 Supplement to Book of ASTM Standards, Part 7, p. 261.

[6] 1953 Supplement to Book of ASTM Standards, Part 7, p. 271.

Committee B-1 on Wires for Electrical Conductors:

This committee has published two tentative specifications which contain rather detailed "conformance criteria":

Tentative Specifications for Hard-Drawn Copper Wire (B 1 – 53 T)[7]

Tentative Specifications for Soft or Annealed Copper Wire (B 3 - 53 T).[8] The pertinent paragraphs from the latter standard are reproduced:

"**Conformance Criteria** (Note 4)

"7. Any lot of wire, the samples of which comply with the conformance criteria of this section, shall be considered as complying to the requirements of Section 4 (*not reproduced*). Individual production units that fail to meet one or more of the requirements shall be rejected. Failure of a sample group from a lot to meet one or more of the following criteria shall constitute cause for rejection of the lot. The conformance criteria for each of the prescribed properties given in Section 4 are as follows:

"(*a*) *Tensile Strength*—The lot shall be considered conforming if the average tensile strength of the specimens is not more than the appropriate tensile strength of Table I (*not reproduced*) minus 800 psi; however, any individual production unit, the specimen from which has a tensile strength more than the appropriate tensile strength value in Table I, shall be rejected.

"If the average is more than the [prescribed maximum], six additional specimens from six production units, other than the four originally sampled, shall be tested ...the tensile strength of each of the ten specimens is not more than the appropriate tensile strength value in Table I and the average of the ten specimens is not more than that value minus 800 psi. [Failure to meet these requirements shall constitute failure to meet the tensile conformance criterion.]

"(*d*) *Dimensions*—The dimensions of the first sample (Table II) shall conform to the requirements of Section 4(*d*). If there are no failures, the lot conforms to this requirement. If there are failures but the number of these does not exceed the allowable defect number, c_2 (Table II), for the respective number of units in the sample, a second sample equal to n_2 shall be taken and the total defects of the n_1 plus n_2 units shall not exceed the allowable defect number, c_2. Failure to meet this requirement shall constitute failure to meet the dimensional conformance criterion.

"(*e*) *Surface Finish*—The surface finish of the samples taken in accordance with Table III shall conform to the requirements of Section 4(*e*). The number of units in the sample showing surface defects not consistent with commercial practice shall not exceed the allowable defect number, *c*, in Table III. Failure to meet this requirement shall constitute failure to meet the surface-finish conformance criterion.

"NOTE 4.—Cumulative results secured on the product of a single manufacturer, indicating continued conformance to the criteria, are necessary to insure an overall product meeting the requirements of these specifications. The sample sizes and conformance criteria given for the various characteristics are applicable only to lots produced under these conditions."

Committee D-2 for Petroleum Products and Lubricants:

This committee has published Recommendations on the Form of ASTM Methods of Test for Petroleum Products and Lubricants,[9] which includes a recommendation on the statement of precision which has been employed in most standards of the committee that have been issued subsequently.

The scope of this practice is as follows:

"**Scope**

"1. (*a*) This recommended practice describes ways in which the precision limits can be used for rejection of faulty test results by an operator and the limits within which the average should be. It is also intended to indicate when results obtained by two laboratories differ by an amount sufficient to be considered suspect, and the limits within which the correct value should be expected.

"(*b*) This practice applies only to those ASTM methods specifically referring to it and is intended to apply at a confidence level of 95 per cent. These recommendations assume that the method is under control by the user and that the material tested behaves in a manner similar to that on which the precision data of the applicable method were obtained.

TABLE II.—SAMPLING FOR DIMENSIONAL MEASUREMENTS.

Number of Units in Lot	First Sample: Number of Units in Sample, n_1	First Sample: Allowable Number of Defects in First Sample, c_1	Second Sample: Number of Units in Sample, n_2	Second Sample: n_1 plus n_2	Second Sample: Allowable Number of Defects in Both Samples, c_2
1 to 14 incl.	All	0	...	...	...
15 to 50, incl.	14	0	...	...	...
51 to 100, incl.	19	0	23	42	1
101 to 200, incl.	24	0	46	70	2
201 to 400, incl.	29	0	76	105	3
401 to 800, incl.	33	0	112	145	4
Over 800	34	0	116	150	4

TABLE III.—SAMPLING FOR SURFACE FINISH AND PACKAGING INSPECTION.

Number of Units in Lot	Number of Units in Sample, *n*	Allowable Number of Defective Units, *c*
1 to 30, incl.	All	0
31 to 50, incl.	30	0
51 to 100, incl.	37	0
101 to 200, incl.	40	0
201 to 300, incl.	70	1
301 to 500, incl.	100	2
501 to 800, incl.	130	3
Over 800	155	4

In 1953 the same committee issued Proposed Recommended Practice for Applying Precision Data Given in ASTM Methods of Test for Petroleum Products and Lubricants.[10] This spells out in greater detail the recommendations mentioned above.

"**Definitions**

"2. Variability is a measure of the inherent random errors of the test operation. The most efficient measure of variability for a normal distribution is the standard deviation. In ASTM methods of test for petroleum products and lubricants, it has been judged useful to evaluate the variability for two different situations as follows:

"(*a*) *Repeatability* is a quantitative measure of the variability associated with a single operator in a given laboratory, generally with the same apparatus and within a small interval of time. It is defined as the greatest difference between two single and independent results that can be considered acceptable (not significantly different) at the 95 per cent probability level (for methods referring to this recommended practice).

"(*b*) *Reproducibility* is a quantitative measure of the variability associated with operators working in two different laboratories. It is defined as the greatest dif-

[7] 1953 Supplement to Book of ASTM Standards, Part 2, p. 5.

[8] 1953 Supplement to Book of ASTM Standards, Part 2, p. 11.

[9] ASTM Standards on Petroleum Products and Lubricants, November, 1953, p. 834.

[10] Appendix IV of Report of Committee D-2, *Proceedings*, Am. Soc. Testing Mats., Vol. 53, p. 379 (1953).

ference between a single test result obtained in one laboratory and a single test result obtained in another laboratory that need not be considered suspect (significantly different) at the 95 per cent probability level (for methods referring to this recommended practice).

"NOTE 2.—The definition for Reproducibility has been based on the simplest comparison possible and the only one that can be anticipated. Nevertheless, when each laboratory "result" is the mean from more than one test, and where the Reproducibility of a method is more than twice as large as the Repeatability, the mean results obtained in the two laboratories may be compared directly with the Reproducibility as described in the following sections without appreciable change in confidence level. However, when Repeatability and Reproducibility have the same, or nearly the same, values, then the number of tests constituting a laboratory mean contributes significantly to the confidence in that mean; this situation does not appear to be a very common one."

Many of the "D" standards already make use of these concepts. For example, in the Tentative Method of Test for Sulfur in Petroleum Products by the Lamp-Gravimetric Method (D 90 - 50 T),[11] the following statement of precision and accuracy appears:

"Precision and Accuracy

"(a) Results should not differ from the mean by more than the following amounts:

Sulfur Content, per cent by weight	Repeatability, One Operator and Apparatus	Reproducibility, Different Operators and Apparatus
0.002 to 0.25....	0.001	0.002
Over 0.25........	0.5 per cent of mean	1 per cent of mean

"(b) Results should not differ from the true value by more than the following amounts:

Sulfur Content, per cent by weight	Accuracy
0.002 to 0.25...	0.002
Over 0.25......	1 per cent of true value

Another example is from the Tentative Method of Test for Mercaptan Sulfur in Jet Fuels (Color-Indicator Method) (D 1219 - 52 T).[12]

"Precision

"6. (a) Duplicate results by the same operator should not differ by more than the following amounts:

Mercaptan Sulfur Content, per cent	Repeatability
Below 0.005.........	0.0002
0.0050 to 0.0100.....	0.0005

"(b) The average of results obtained in different laboratories should not differ by more than the following amounts:

Mercaptan Sulfur Content, per cent	Reproducibility
Below 0.0050.......	0.0005
0.0050 to 0.0100.....	0.0025

The satisfactory definition of terms such as "repeatability" and "reproducibility" is difficult because, in every specific application to testing of a material, a concept that is quite generally applicable must be restricted in some way. This anomaly has resulted in considerable criticism of the attempts of various committees to define precision and accuracy requirements closely. The criticism is due, generally, not to misuse of statistics, but to the failure to state clearly the restrictions on the definitions. For example, the definitions published by Committee D-2 should probably have some qualifying designation such as "D-2 repeatability," "D-2 reproducibility," and so forth.

Committee D-13 on Textile Materials:

This committee published Recommendations on the Form of ASTM Methods of Test for Textile Materials,[13] similar to the D-2 recommendations. The section on accuracy and precision is, in part, as follows:

"Accuracy and Precision

"The ability to express precision depends on the nature of the methods as noted in the following examples.

"CASE 1.—On repeated tests involving a standard procedure or method, information on the precision or error of measurement can be presented with respect to several characteristics, for example:

"A. *Repeatability.*—A measure of deviation of test results from their mean value, all determinations being carried out by one operator and without change of apparatus where apparatus can be significant. This value is intended to indicate to the operator how well his observed precision compares with that of other experienced analysts.

"NOTE 7.—If appreciably different results are obtained by the same operator using different apparatus, it is probable that one of the pieces of apparatus does not meet specifications.

"NOTE 8.—The value reported for "Repeatability" should not be based on the work of a single expert but should be the average results obtained from several well-trained technicians.

"B. *Reproducibility.*—A measure of the deviation of test results from their mean value, the determinations being carried out by different operators using apparatus generally understood to be located in different laboratories. This value reflects the precisions to be expected when the same material is tested in two or more laboratories; for instance, in the laboratories of the buyer and the seller.

"NOTE 9.—In applying "Reproducibility" limits to compare results obtained by two or more laboratories, the mean value taken should be that obtained by using as individual results, the average result of all operators in each individual laboratory.

"C. *Stability.*—A measure of the deviation of test results from their mean value when the determinations are carried out by the same operator with the same equipment after successive time intervals.

"NOTE 10.—Lower precision over a period of time suggests loss of calibration, atmospheric influences, instability of reagents or equipment, etc.

"NOTE 11.—Various intermediate degrees of precision can be stated if desired. For instance, the reproducibility which could be expected by a single operator using different sets of apparatus or different operators using the same equipment.

"CASE 2.—A simple statement of precision may not be justified in a method which covers a range of conditions and where the precision may depend upon the nature of the materials present and possibly on their amounts. An example would be the chemical estimation of fiber types in mixed yarn or blends, for example, the precision of the determination of cotton will depend on the nature of the other cellulose materials present and their relative amount.

"CASE 3.—A statement of precision cannot be made in tests which involve "go" or "no go" answers as distinct from measurable characteristics. An example would be the identification of a single fiber type.

"In the above determinations the assumption is made in each case that operators and laboratories are using the same homogeneous sample, so that the variation in the material itself is not a factor in the variability experienced. In practice, this may be difficult to realize but the samples should be prepared to obtain a maximum of homogeneity. Analysis of the data by analysis of variance techniques will give an indication as to whether the variation contributed by the material itself has been eliminated or reduced sufficiently....

"Instead of specifying the precision of a specific method a committee may wish to specify the over-all variability, etc., experienced when a particular test method is used with a particular material. Such a value would be the composite error due to variations in the material plus errors of measurement associated with a particular test or procedure. Techniques for collecting data and for the determination of the precision of such measurements can be found by reference to the Proposed Rec-

[11] 1952 Book of ASTM Standards, Part 5, p. 21.

[12] 1952 Book of ASTM Standards, Part 5, p. 631.

[13] ASTM Standards on Textile Materials, November, 1953, p. 616.

ommended Practice for Calculating Number of Tests to be Specified in Determining Average Quality of a Textile Material."

The last mentioned practice is pertinent as a whole and may be obtained from the ASTM.

Another important publication of this committee is the ASTM Tentative Recommended Practice for Interlaboratory Testing of Textile Materials (D 990 - 52 T).[14]

Some examples of precision and accuracy requirements in standards of this committee follow:

Tentative Methods of Test for Abrasion Resistance of Textile Fabrics, Oscillatory Cylinder Method (D 1175 - 51 T).[15]

"Reproducibility

"20. (*a*) *Repeatability* (*Inherent Reproducibility*).—Averages of 16 residual breaking strength measurements made by one operator on a single tension testing machine on cloth abraded upon the machine shall be within 5 per cent of its material average with a probability of 95 per cent. The percentage loss in breaking strength of averages of 16 measurements made by one operator on a single tension testing machine on cloth shall lie within 6 per cent of its material average with a probability of 95 per cent. The material average for any one machine-operator combination for practical purposes is the average of 25 or more measurements, if the machine is in statistical control as determined by standard control chart techniques.

"(*b*) *Reproducibility* (*Over-all Reproducibility*).—Residual breaking strength averages of 16 residual breaking strength measurements made by one operator on a single tension testing machine on cloth abraded upon more than one machine (each machine having a different operator) shall be within 5 per cent of the grand average with a probability of 95 per cent.

The percentage loss in breaking strength of averages of 16 measurements made by one operator on a single tension testing machine on cloth abraded upon more than one machine (each machine having a different operator) shall be within 20 per cent of the grand average with a probability of 95 per cent. The grand average for practical purposes shall be the over-all average of the material averages from three or more laboratories, material averages as defined in Paragraph (*a*)."

Tentative Method of Test for Snag Resistance of Hosiery (D 1115 - 50 T).[16]

"Accuracy and Precision

"8. (*a*) The repeatability of this method by an operator is approximately plus or minus 16 per cent for snag counts above 5 per square inch and is approximately plus or minus 32 per cent for snag counts below 1 per square inch."

Other ASTM Statistical Activities:

Some of the principal papers in symposiums which have appeared since 1947 are listed in the attached References.

Conclusion

It is to be noted that in ASTM the trend is toward adopting standard statistical clauses in material standards. Other groups interested in standards have been developing statistical standards, for example, the American Society for Quality Control Standard Al-1951, "Definitions and Symbols for Control Charts."

It is encouraging to find a gradual change in the statistical content of most ASTM standards. Standards are not dead but rather living, growing concepts. They feed on new data, and any failure of the system that provides the data is reflected in a stunted or inadequately nourished standard.

Sources of Standards

American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa.

American Society for Quality Control, Room 563, 50 Church St., New York 17, N. Y.

American Standards Assn., 70 E. 45th St., New York, N. Y.

Superintendent of Documents (Military Standards), U. S. Government Printing Office, Washington 25, D. C.

Johns-Manville Corp., Quality Control Department, 22 E. 40th St., New York, N. Y.

Joint Electron Tube Engineering Council, c/o J. R. Steen, Sylvania Electric Products, Inc., 1740 Broadway, New York, N. Y.

National Bureau of Standards, Washington 25, D. C.

References to ASTM Publications

(1) ASTM Manual on Presentation of Data (1946). (Issued as separate publication *ASTM STP No. 15-B.*)

(2) Discussion on Statistical Quality Control in Its Application to Specification Requirements (1946). (Issued as separate publication *ASTM STP No. 66.*)

(3) J. W. Schade and F. L. Roch, "Developments and Improvements in Methods of Stress-Strain Testing"; Ludwig Meuser, Robert D. Stiehler, and R. W. Hackett, "Standardization of Testing and Inspection in Government Rubber Plants"; and Marian M. Sandomire, "The Use of Statistical Methods in Rubber Evaluation," Symposium on Rubber Testing (1947). (Issued as separate publication *ASTM STP No. 74.*) The papers in this symposium stress the importance of standardization in the rubber industry.

(4) Symposium on the Usefulness and Limitations of Samples, *Proceedings*, Vol. 48, p. 857 (1948).

(5) Symposium on Application of Statistics (1949). (Issued as separate publication *ASTM STP No. 103.*)

(6) Symposium on Bulk Sampling (1951). (Issued as separate publication *ASTM STP No. 114.*)

(7) Symposium on Statistical Aspects of Fatigue (1951). (Issued as separate publication *ASTM STP No. 121.*)

(8) ASTM Manual on Quality Control of Materials (1951). (Issued as separate publication *ASTM STP No. 15-C.*)

(9) Symposium on Statistical Methods for the Detergent Laboratories (1952). (Issued as separate publication *ASTM STP No. 139.*)

[14] 1952 Book of ASTM Standards, Part 7, p. 60.

[15] 1952 Book of ASTM Standards, Part 7, p. 156.

[16] 1952 Book of ASTM Standards, Part 7, p. 217.

An Instrument for Measuring the Chip Resistance of Paints

By E. P. Brightwell[1]

UNDER normal service conditions paint chips through blows by objects having relatively small mass and sharp edges, moving at moderate to high velocities. The forces involved are not sufficient to deform the substrate (surface which has been painted) but are great enough to chip off parts of the paint, revealing the substrate.

No precise instrument has been available up to the present time for making reproducible chip resistance measurements of paint systems. The Gravelometer[1] type instrument at best gives only qualitative results and does not lend itself well to making measurements under varying environmental conditions.

Description of Instrument:

For the work described in this paper, an instrument has been designed and built which approximates the conditions causing chipping of paint systems. Because it is compact and easily moved, the instrument can be taken to rooms conditioned to various temperatures and humidities. It is convenient to operate and gives reproducible results. To measure precisely and reproducibly the ability of paint finishes to resist chipping in this instrument, a relatively small mass can be propelled at different and controllable velocities.

Its essential parts are a base plate *A*, metal blocks *B* for supporting the large rod *C*, and a small plunger *D*. (See Fig. 1.) The sample to be tested is held rigidly by a panel holder *E*. Because the angle of the panel holder is variable, the range of the instrument can be varied.

The large rod (mass approximately 800 g) because of a spring attached provides the force necessary to cause chipping. Springs having different force constants may be used to increase the versatility of the instrument. The small plunger through a hardened steel head (Fig. 2) strikes the paint sample being tested and produces the chips. The mass of the plunger assembly is approximately 50 g.

The spring tension on the large rod can be varied by setting the rod at various displacements. The rod is released by means of a trigger mechanism. When released, the large rod strikes the small plunger which moves with a high velocity. The distances between the rod and plunger are such that the plunger will be free to bounce away from the paint sample after the blow is struck.

The shape of the hardened steel head (Fig. 2) was designed so that relatively sharp edges would strike the sample being tested. It was found by experiment that spherical shaped heads did not produce chips; thus there must be surface penetration rather than mere denting before chips will occur The sharpness of the edge which strikes the surface being tested may be varied by changing the angle of the panel holder. The area of the head exposed to the sample being tested is decreased when the panel holder is made more nearly vertical. This permits easier penetration and effectively changes the range of the instrument.

It is always desirable when rating any material to be able to assign to it a

Paints under normal service conditions are subjected to blows by sharp small objects which produce chips, causing an unsightly appearance and serious corrosion in the exposed areas. This instrument will measure the relative chip resistance of paint systems.

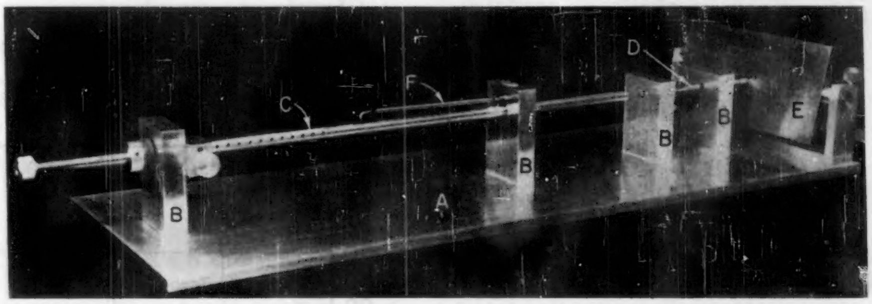


Fig. 1.—Instrument for Measuring Chip Resistance of Paint Systems.
A—Base plate. *B*—Supporting blocks. *C*—Large rod. *D*—Plunger. *E*—Panel Holder. *F*—Spring.

Fig. 2.—Plunger Assembly Showing Enlarged View of Striking Head.

E. P. BRIGHTWELL received his MS in Physics from University of North Carolina in 1951. Since then he has been engaged in the development of testing instruments and techniques in the Physical Testing Group of the Fabrics and Finishes Division of E. I. du Pont de Nemours & Co. Wilmington, Del.

NOTE.—DISCUSSION OF THIS PAPER IS INVITED, either for publication or for the attention of the author. Address all communications to ASTM Headquarters, 1916 Race St., Philadelphia 3, Pa.

[1] Gardner and Sward, "Physical and Chemical Examination — Paints — Varnishes — Lacquers — Colors," H. A. Gardner Lab., Inc. Bethesda, Md. 11th Edition, p. 188.

numerical value. With this instrument the most convenient numerical value is the velocity of the large rod required to produce chipping.

The velocity which the large rod will attain for any displacement (stretch of spring) may be calculated quite easily.[3] If a spring is stretched a distance X then Hooke's law states that

$$F \propto X \text{ or } F = KX$$

Where F is the force required to hold the spring at a distance X, and K is the proportionality constant called the force constant of the spring. The force constant may be defined as the force per unit elongation. The force exerted on the rod by the spring is $-KX$, thus from Newton's second law:

$$F = -KX = MA = MV\frac{dV}{dX}$$

$$MVdV = -KXdX$$

$$\int_{V_0}^{V} MVdV = -\int_{X}^{0} KXdX$$

$$\tfrac{1}{2}MV^2 - \tfrac{1}{2}MV_0{}^2 = \tfrac{1}{2}KX^2$$

V_0, the initial velocity, is 0; therefore, solving for V, the velocity of the large rod:

$$V = \left(\frac{K}{M}\right)^{1/2} X$$

The velocity as calculated neglects the weight of the spring and any frictional forces present. This is a valid assumption in this case since these two quantities are small compared to the other forces involved.

Although the velocity of the large rod does not give the actual force exerted on the sample by the plunger, this force is proportional to the velocity; and since only relative values are needed, then paints may be rated quantitatively according to the velocity required to chip them.

The error varies with the method of panel preparation and with other factors, but the standard deviation of the mean of 3 tests on a panel is in general less than 10 per cent of the value obtained for the panel.

Applications:

Additional useful information may be obtained from an investigation of the nature of the chip. Chip size is a variable which is important to the complete evaluation of the usefulness of a paint system. It is also important to know in which component of the paint system the failure occurs. In one case, the failure may occur at the interface

[3] F. Sears, "Principles of Physics," Vol. 1. "Mechanics, Heat and Sound," Addison-Wesley Press, Inc., Cambridge, Mass., p. 129.

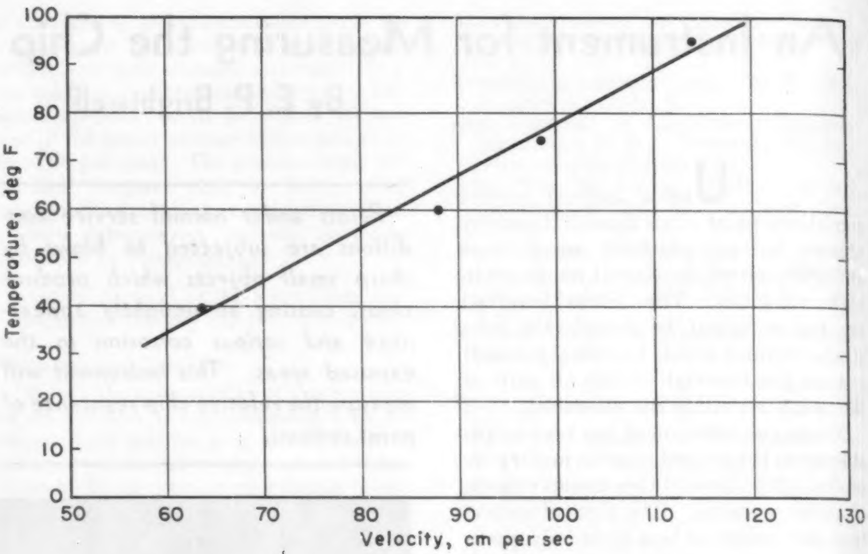


Fig. 3.—Temperature *versus* Velocity (Automotive Finishes).

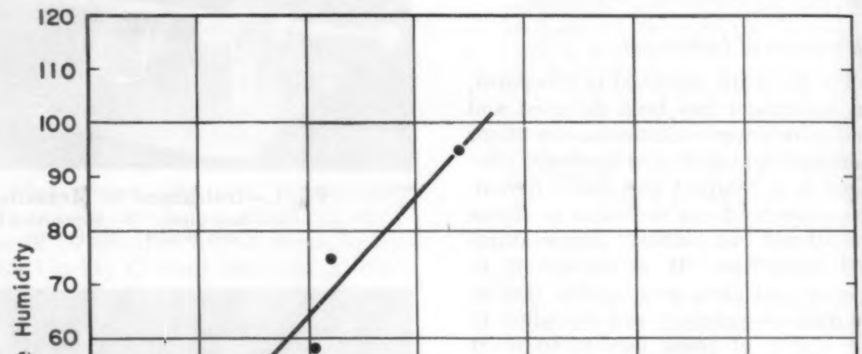


Fig. 4.—Humidity *versus* Velocity (Automotive Finishes).

between multiple coat systems; in another, it may occur within one of the coats; finally, the chip may penetrate all the way to the substrate. With this instrument the chip size and the component in which the failure occurred may both be determined.

The instrument is especially well adapted for investigating the chip resistance of automotive finishes. Under normal operating conditions automobiles are subjected to flying pebbles that cause chipping of the finish. The small mass of the plunger with its relatively sharp edges, its high velocity, and the fact that it is free to bounce away from the surface after the blow has been struck make it an excellent approximation of a flying pebble. For any particular type of paint the angle of impact which gives the greatest sensitivity and best range must be determined experimentally. In the case of automotive finishes the angle of the panel holder is approximately 14 deg from the vertical.

Other types of finishes, such as furniture and architectural, may be evaluated with this instrument. The optimum

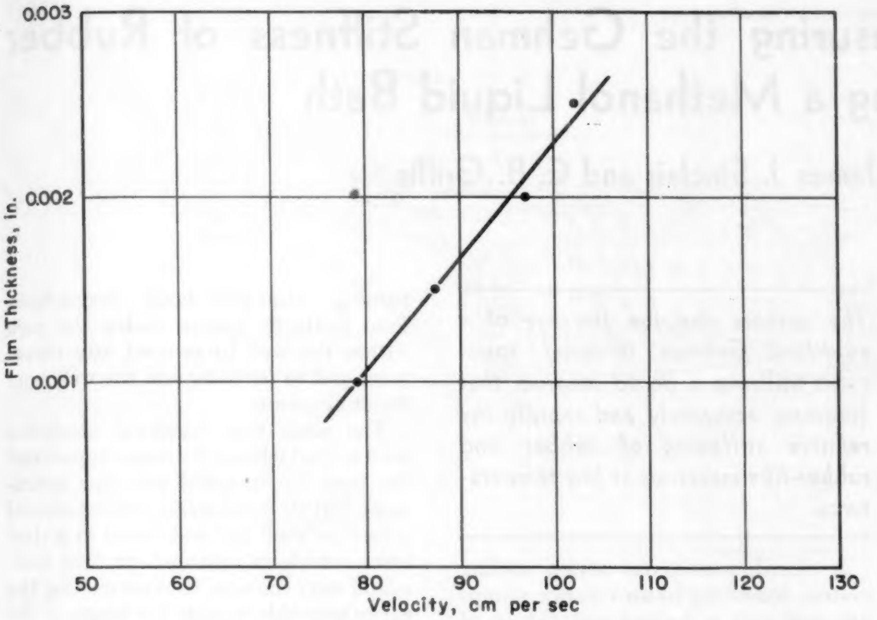


Fig. 5.—Film Thickness *versus* Velocity to Chip (Automotive Finishes).

condition for testing must be determined by experiment for each type.

It has been found that certain environmental factors such as temperature and humidity have marked effects on most paint systems. These effects on typical automotive systems are shown in Figs. 3 and 4. Due to the small size of the instrument and the ease with which it can be moved, it may be placed in a room where these conditions can be controlled over large ranges, and the chip resistance can be measured under these conditions.

Another physical property which affects the chip resistance is film thickness. The effect is shown in Fig. 5 for a typical product and indicates higher chip resistance for thicker films.

An illustration of the ability to distinguish between different automotive lacquer systems is shown in the following table.

System	Velocity Required to Produce Chipping, cm per sec			
	Trial 1	Trial 2	Trial 3	Avg
A........	235	214	235	228
B........	214	214	192	207
C........	150	150	150	150
D........	135	135	135	135
E........	105	105	105	105
F........	85	85	85	85

Acknowledgment:

The author is indebted to Joseph Secor for his assistance in designing and constructing this instrument.

Discussion of Paper on Measurements of Motor Oil Viscosity at 0 F[1]

MR. W. FITZGERALD.[2]—From the data shown in this article, it is not clear whether a correction was made for end effect. It would be interesting to know whether this has been incorporated in the bob height, h, the actual dimension of which is not disclosed, or in the shape of the lower face of the bob. In this connection it is generally considered that with a relatively large clearance between the lower face of the bob and the bottom of the cup the end effect results in about 2 per cent error. Has the author investigated this point at low temperatures when a second phase is present? If end effect has not been introduced into the calculations, this would account for the higher values with the Stormer viscometer at 100 F.

Before the introduction of the vertical grooves to the bob and the cup screen, was slippage at the contact surfaces experienced at the low rates of shear encountered in the tests?

The term $[(1/R_B^2) - (1/R_C^2)]$ in Reiner's equation appears to have been misprinted in Eq. 2.

MR. FOREMAN (*author's closure*).—Regarding the end effect, we considered that the use of a hollow-end bob eliminated it mechanically. Actually our recent studies show this assumption is not valid, and the end effect, which can be as high as 10 per cent, must be either corrected for or incorporated in a calibration constant. We have been doing the latter in our recent work. The results reported in the above paper would have been high because of this end effect if a fortuitous, nearly compensating temperature effect had not been present. We discovered by use of sensitive thermocouples that the metal bob conducted heat so readily and the oils were such poor conductors that the bob surface was 2 to 4 C higher than expected. This produced a lower measured viscosity which almost exactly compensated for the neglected end effect. Recent work which I plan to offer for publication was performed with a plastic bob and with full consideration of end effect. The use of a grooved bob was found to be unnecessary with the winter grade oils; hence our plastic bob was smooth-surfaced. No slippage has occurred with this bob.

The term $[(1/R_B^2) - (1/R_C^2)]$ in Eq. 2 was misprinted in the paper as you suspected.

[1] R. W. Foreman, "Measurements of Motor Oil Viscosity at 0 F," ASTM BULLETIN, No. 191, July, 1953, p. 50 (TP94).

[2] Ab Nynas-Petroleum, Oljeraffinaderiet, Nynashamn, Sweden.

A Method of Measuring the Gehman Stiffness of Rubber Utilizing a Methanol Liquid Bath

By James J. Sinclair and C. B. Griffis

The authors describe the use of a modified Gehman torsional apparatus utilizing a liquid medium that measures accurately and rapidly the relative stiffening of rubber and rubber-like materials at low temperatures.

ONE of the important objectives of the rubber technologist today is the improvement of performance of elastomers at low temperatures. The Gehman torsional apparatus for measuring the stiffness of rubber is widely used in physical testing in connection with such performance studies. But this equipment has certain limitations associated with its air-bath cooling.

Consequently, the Quartermaster Research and Development Laboratories, Chemicals and Plastics Div., Philadelphia, Pa., has developed an instrument for measuring the Gehman stiffness of rubber utilizing a liquid bath. With the modified apparatus an operator can measure many more samples in a given time with greater ease of operation; reproducible results are obtained through close temperature control.

The methanol bath accommodates a greater number of specimens for test in any single run and permits the faster, more accurate control that can be accomplished over a liquid medium rather than over an air medium. An experienced operator can run approximately 40 samples a day using the liquid bath method, compared to 15 by the air bath method.

Most operators of air-medium Gehman rubber stiffness instruments have experienced either freezing of condensate in air lines or loss of dry ice in the cooling chamber. These difficulties often cause either long delay or complete failure of the test. Such difficulties are eliminated entirely if the liquid-medium instrument is used.

Test Apparatus

The new piece of equipment consists of a rectangular steel shell (Fig. 1) with the sides and bottom insulated with tightly packed asbestos. A stainless steel well is placed within the insulation and a specimen rack is placed inside the well. A stirring assembly in the bottom of the well is powered by an explosion-proof electric motor geared for 180 rpm. A flexible immersion type heating unit with a Variac control is installed within the well.

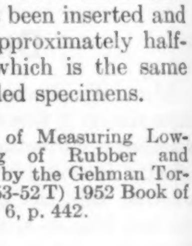
A closed, continuous action cooling system consisting of an exterior pumping unit and a cooling coil ($5\frac{1}{2}$ ft of $\frac{1}{4}$-in.-diam copper tubing) within the well is incorporated in the instrument. This system uses methanol cooled by dry ice. The pumping unit (not shown) is in an insulated dry-ice chamber (7-in. square), which also contains the explosion-proof electric pump. The cooled methanol goes from the pumping chamber, through the coils, and returns to the chamber for recooling. This system enables the operator to maintain a constant temperature of -65 C for an indefinite period. Colder temperatures can be obtained for short periods of time by introducing dry ice directly into the well.

The specimen rack holds ten specimens, secured to the bottom of the rack by 10 aluminum screw type clamps $\frac{3}{4}$-in. apart, and secured at the top by freely turning stud-and-clamp assemblies. Four butterfly clamps fasten the rack within the well to prevent any movement and to partially seal the well from the atmosphere.

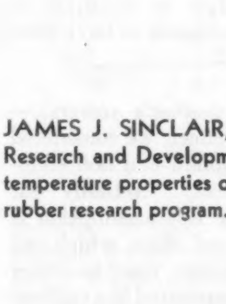
The same type torsional headpiece used in the Gehman torsional apparatus[1] has been incorporated into this instrument, but the head collar is fitted around a vertical steel bar embedded in a steel block which is mounted on two horizontal steel runners, thus permitting the entire assembly to slide the length of the box. This headpiece has been placed so that the calibrated wire assembly is suspended directly over the freely turning studs. The head assembly can be moved vertically or horizontally, or swung from side to side. This moving action permits the calibrated wire to be easily clamped to the studs even though the studs may be off center due to the stiffening of the specimens.

On the upper left side of the instrument a partial immersion thermometer (3-in. immersion) has been inserted and extends to a point approximately halfway into the well, which is the same depth as the suspended specimens.

[1] Tentative Method of Measuring Low-Temperature Stiffening of Rubber and Rubber-Like Materials by the Gehman Torsional Apparatus (D 1053-52 T) 1952 Book of ASTM Standards, Part 6, p. 442.



JAMES J. SINCLAIR, Technologist, U. S. Army Quartermaster Research and Development Labs., Philadelphia, is working on low temperature properties of experimental elastomers in the Army's big rubber research program.



C. B. GRIFFIS, Assistant Chief, Rubber Branch, Chemicals and Plastics Div., Headquarters Quartermaster Research and Development Command, Natick, Mass. has worked for 6 years in the Army's rubber research program, evaluating a wide variety of experimental elastomers subjected to environmental extremes.

NOTE.—DISCUSSION OF THIS PAPER IS INVITED, either for publication or for the attention of the author. Address all communications to ASTM Headquarters, 1916 Race St., Philadelphia 3, Pa.

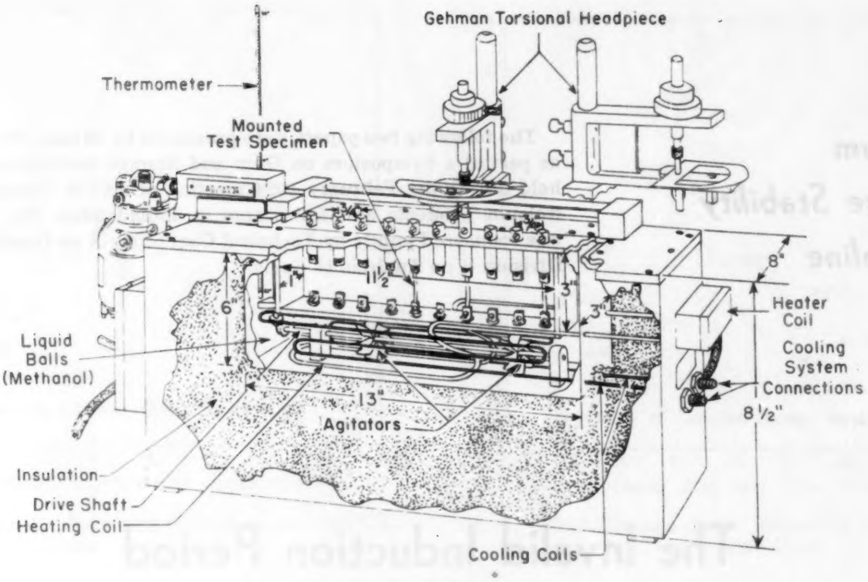


Fig. 1—Cold Flex Tester.

Test Procedure

The procedures for testing were identical with those described in the ASTM method[1] with the exception that a methanol liquid medium was used. Any liquid which is not detrimental to the elastomer tested and which remains liquid throughout the desired temperature range can be substituted.

Nine individual vulcanized rubber stocks were chosen to be used as a means of determining the validity of the results obtained with the methanol bath in comparison with the results obtained using an air medium. The nine rubber stocks used were supplied by the Chemicals and Plastics Divisions Pilot Plant.

The physical properties of the rubber stocks used are given in Table I.

Test results obtained with the two procedures for determining the Gehman stiffness of rubber are given in Table II.

Study of the results obtained and the procedures required for using both types of apparatus indicates that the liquid-medium instrument exhibits greater speed than the air-medium type, is easier to operate, increases daily testing output by 166 per cent, and reduces percentage of failure of test runs. It gives results that are as accurate and reproducible as those obtained using an air medium.

Acknowledgment:

The authors wish to express their appreciation to J. C. Montermoso, Office of the Quartermaster General, Washington, D. C., under whose general supervision this work was accomplished; and to the Instrument Development Section, QM Research and Development Laboratories, for making the instrument.

TABLE I.—PHYSICAL PROPERTIES OF RUBBER SAMPLES.

Type of Rubber	Tensile Strength, psi	Elongation, per cent	Stress at 300 per cent Elongation, psi	5-sec Hardness, Shore "A"
Natural Rubber (smoked sheet)	3200	420	2000	62
Hycar OR-15	3880	505	1800	62
Neoprene FR	3500	570	1800	70
Thiokol ST	1600	410	1200	66
GR-S X-600	3250	390	2100	61
GR-S X-627	2500	315	2300	61
General Tire polymer A	2400	430	1270	47
GR-S X-489	1800	340	1450	50
GR-S X-100	3550	480	1750	58

TABLE II.—TEMPERATURES OF SAMPLES AT RELATIVE MODULI OF 2, 5, 10, AND 100 AFTER 5 MIN CONDITIONING TIME.

		Temperature, deg Cent, at T2		Temperature, deg Cent, at T5		Temperature, deg Cent, at T10		Temperature, deg Cent, at T100	
Type of Rubber	Run No.	Methanol	Air	Methanol	Air	Methanol	Air	Methanol	Air
Natural Rubber (smoked sheet)	1	−38	−41	−51	−52	−55	−55	−64	−63
	2	−35	−40	−50	−51	−54	−54	−63	−60
	3	−37	−40	−50	−50	−54	−54	−61	−59
Hycar OR-15	1	−3	+1	−8	−8	−10	−12	−17	−23
	2	−0	+1	−8	−8	−10	−12	−15	−23
	3	−2	+2	−10	−7	−12	−12	−15	−23
Neoprene FR	1	−32	−34	−42	−40	−44	−43	−53	−53
	2	−34	−34	−42	−41	−44	−44	−49	−54
	3	−31	−35	−40	−39	−43	−42	−49	−54
Thiokol ST	1	−32	−26	−44	−39	−48	−45	−59	−52
	2	−30	−28	−42	−41	−46	−47	−57	−57
	3	−29	−30	−44	−43	−48	−47	−59	−53
GR-S X-600	1	−46	−48	−57	−56	−60	−59	−67	...
	2	−44	−46	−56	−53	−60	−58	−66	−69
	3	−50	−43	−58	−56	−61	−58	...	−66
GR-S X-627	1	−45	−40	−57	−55	−60	−58	−68	−68
	2	−45	−45	−57	−54	−60	−58	−67	−66
	3	−45	−45	−56	−53	−59	−58	−68	−68
General Tire Polymer A	1	−51	−55	−61	...	−66	...	...	...
	2	−54	−55	−62	−60	−66	...	...	...
	3	−55	−53	−64	−60	...	...	...	...
GR-S X-489	1	−45	−50	−66	...	...	...	...	...
	2	−47	−49	−66	...	...	...	...	...
	3	−47	−50	...	−64	...	...	...	...
GR-S X-100	1	−33	−35	−44	−42	−47	−45	−53	−55
	2	−28	−34	−42	−42	−46	−46	−51	−57
	3	−33	−31	−43	−42	−45	−47	−54	−56

Papers on Gum and Storage Stability of Gasoline

The following two papers were presented by Messrs Power and Donahue as part of a Symposium on Gum and Storage Stability of Motor Gasoline held during the February 1954 meeting of ASTM Committee D-2 on Petroleum Products and Lubricants in Philadelphia, Pa. The symposium was sponsored jointly by Technical Committee A on Gasoline and Research Division V on Analysis of Fuels.

The Invalid Induction Period

By William R. Power

The author calls attention to the limitations of ASTM D 525 as a method for predicting gasoline stability. Field and laboratory data purport to show some of the hazards involved in placing too much reliance on this method.

ASTM Committee D-2 on Petroleum Products and Lubricants publishes an authoritative manual entitled "ASTM Standards on Petroleum Products and Lubricants." In this manual appears the Standard Method of Test for Oxidation Stability of Gasoline (D 525 – 49)[1]. Known also as the "Induction Period," this test has the status of a "Full Standard" not just a "Tentative." In addition, it has been approved by the American Standards Assn as an American Standard, so the Induction Period is in excellent printed repute. The author nevertheless, as implied by the title of this paper, does not consider the method reliable. It is true that this supposed unreliability has not yet affected the generally high quality of the nation's civilian gasoline, but this high quality should not be taken as a testimonial to the usefulness of the Induction Period since most refiners have found that this method must be modified, or supplemented, or totally ignored. This last course might not seem so foolish if everyone realized, as our company does, that 20-hr or even 30-hr induction periods do not insure satisfactory gasoline stability. We have, for example, produced gasolines with 30-hr induction periods which were considered unsatisfactory from a stability standpoint because other tests proved the gasolines were not thoroughly copper-deactivated. The method, however, takes no cognizance of this weakness.

As chairman of Section VII on Storage Stability of Technical Committee A on Gasoline the author feels impelled to refer to the Section's first report of June 10, 1952, concerning the inadequacy of the Induction Period. In this report nine sets of data were shown in graphical form as illustrations of the lack of correlation of the induction period with gum formation in storage.

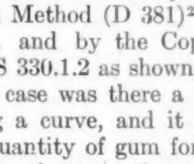
We were rather proud of that report since we had been directed to find such data, and we did just that. Our pride was short-lived however, as we found that our accumulated data were not acceptable for one reason or another. One objection was based on the use of laboratory-size samples, and we readily agreed that large-volume tankage data would be more impressive. No one had such data, however, so the laboratory storage-stability programs elicited from various laboratories were considered the best data in existence. Subsequent to the June, 1952 report, data were received from Continental Oil Co. resulting from a field storage program. In this program, five different commercial gasolines were tested in 300-gal-capacity tanks of the type lent to farmers in some rural areas. The storage test was started in April, 1948, and data pertinent to the present discussion have been plotted in Figs. 1 and 2.

The gum was measured by the ASTM Glass Dish Method (D 381)[2] as shown in Fig. 1, and by the Copper Dish Method FS 330.1.2 as shown in Fig. 2. In neither case was there a possibility of drawing a curve, and it is evident that the quantity of gum formed after ten months of storage is unrelated to the initial induction period. As a matter of fact, the lower induction-period gasolines seemed to be more stable than the higher induction-period gasolines. What does this prove? Perhaps not much in itself, but it is another reflection on the induction period, and it should serve as one answer to the objection that field data were lacking in the June, 1952 report.

Other objectors to the June, 1952 report said in essence: "The test may not be any good, but we're not having any

[1] 1952 Book of ASTM Standards, Part 5, p. 224.

[2] Tentative Method of Test for Existent Gum in Fuels by Jet Evaporation (D 381 – 52 T) 1952 Book of ASTM Standards, Part 5, p. 174.



WILLIAM R. POWER, Assistant Chief Chemist, Cities Service Oil Co., East Chicago, Ind., has been in close contact for 13 years with problems concerning the manufacture and use of gasoline. He has been active too in gasoline stability studies conducted by ASTM and the Coordinating Research Council.

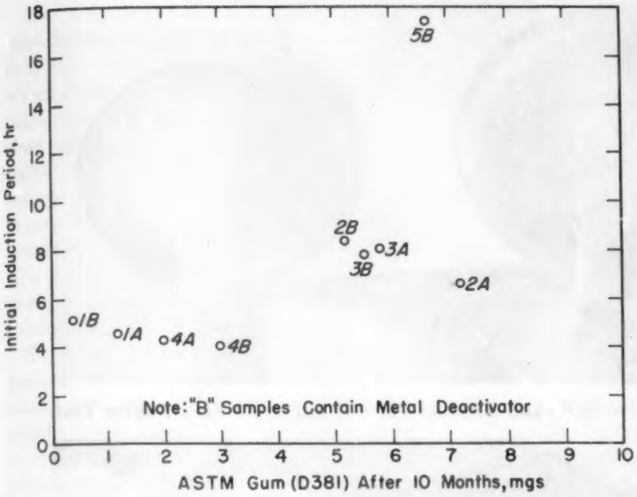


Fig. 1.—Field Storage Test. Induction Period *versus* ASTM Gum.

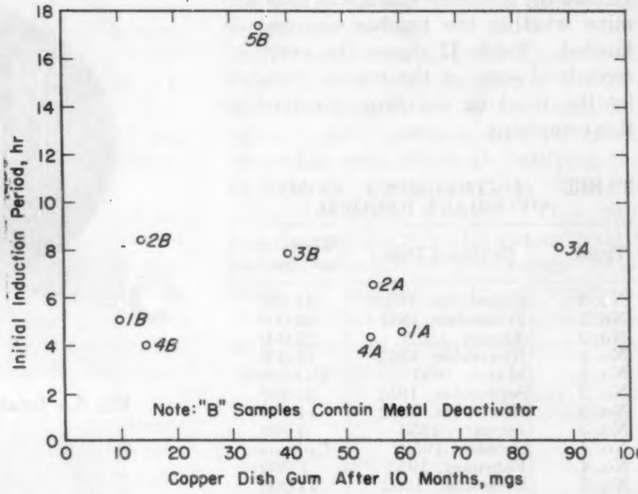


Fig. 2.—Field Storage Test. Induction Period *versus* Copper-Dish Gum.

gasoline gum troubles." We will agree that it is tempting to close our eyes to the inaccuracies of this method, but we cannot agree that the country is free from gum troubles. The author's company has made midwestern surveys of leading refiners' gasolines which show some dangerously high gum contents; Table I lists just a few of the worst of these.

We realized long ago that service-station surveys are valueless unless a carefully supervised sampling procedure is used. Such a procedure has been worked out by our laboratory and has virtually eliminated bad samples. All the gasolines listed in Table I were, of course, tested for all other known gasoline properties, and it was found that all other tests on these gasolines were normal. In other words, these high gums are not due to contamination. As to the frequency of occurrence, our findings for the past two years indicate 5 per cent of the gasolines sold by the leading marketers have more than 5 mg of existent gum. It should be noticed too that these gasolines all have long induction periods, and the test may well have helped to lull these refiners into a false belief in their gasolines' stability.

The latest objection to the Section's Report on the inadequacy of the induction period is based on its lack of engine performance data. In other words, it is believed by some that an attempt to improve or remove the Induction Period Test Method is uncalled for unless the method can be proved responsible for some bad engine performances. The author does not hold with this, since he believes Committee D-2 should be willing to work on a method with less persuasive data than field equipment failures. In an attempt to answer this objection however, one instance of engine difficulty due to gasoline gum will be cited.

The investigators of this difficulty did not begin their investigation with the thought that the gasoline was at fault.

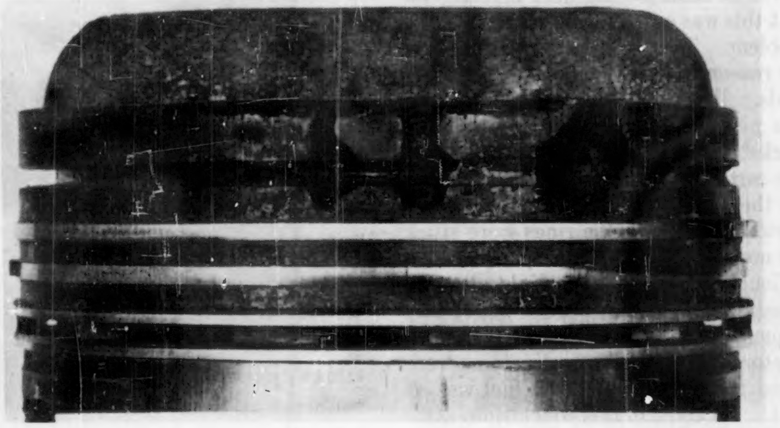


Fig. 3.—Ring Zone of Piston Removed from Truck in Field Complaint.

Fig. 4.—Piston Skirt from FL-2 Engine Test.

TABLE I.—EXCESSIVE GUM WITH HIGH INDUCTION PERIOD.
(Service Station Gasolines.)

Refiner	Area	Date	Existent Gum, mg per 100 ml	Induction Period, min
No. 1......	Ohio	8-19-52	15.0	976
No. 3......	Minnesota	4-17-52	66.0	690
No. 3......	Texas	4- 4-52	17.4	1094
No. 3......	Wisconsin	9-15-52	29.0	525
No. 4......	Ohio	1-24-52	25.8	831
No. 4......	Ohio	4-14-52	16.0	860
No. 11......	Ohio	10- 2-52	12.4	830

In fact the first step taken was to determine whether the trouble was real or fancied. Table II shows the overhaul records of some of the trucks operated by the trucking company involved in this complaint.

TABLE II.—TRUCKING COMPANY OVERHAUL RECORD.

Truck	Overhaul Date	Miles since last overhaul
No. 1....	September, 1952	34 000
No. 1.....	December, 1952	16 000
No. 2....	August, 1952	23 000
No. 2....	November, 1952	14 000
No. 3. ..	March, 1952	Unknown
No. 3....	September, 1952	20 000
No. 3....	November, 1952	14 000
No. 3....	January, 1953	8 000
No. 4....	October, 1952	Unknown
No. 4.....	February, 1953	7 000
No. 5....	December, 1952	11 000

Additional units were following the same pattern revealed in Table II and it was evident to the field investigator that this was a real rather than a fancied problem. The next step was to find the reason for these too frequent overhauls. Figure 3 shows the ring zone of a piston removed from one of these trucks; it is pictured to show the excessive carbon build-up in the ring grooves and the missing ring from the top groove. Obviously some of the rings were stuck and none could perform properly.

Visual inspection in the field also disclosed deposits which were so heavy and frequent in intake manifolds and carburetors that the investigators were forced to conclude that the fuel was at fault. To confirm this conclusion, samples of the gasoline were subjected to laboratory engine tests by the FL-2 procedure. The crankcase oil was the widely used reference oil, REO-7-48; Figs. 4, 5, and 6 show typical engine parts.

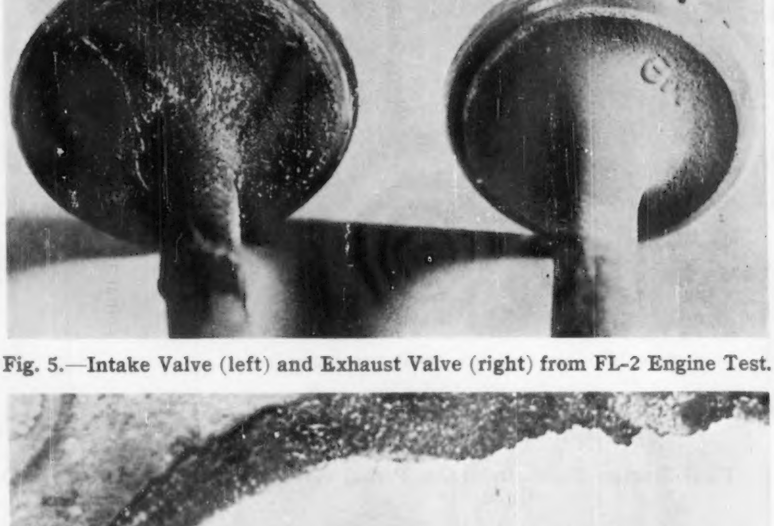


Fig. 5.—Intake Valve (left) and Exhaust Valve (right) from FL-2 Engine Test.

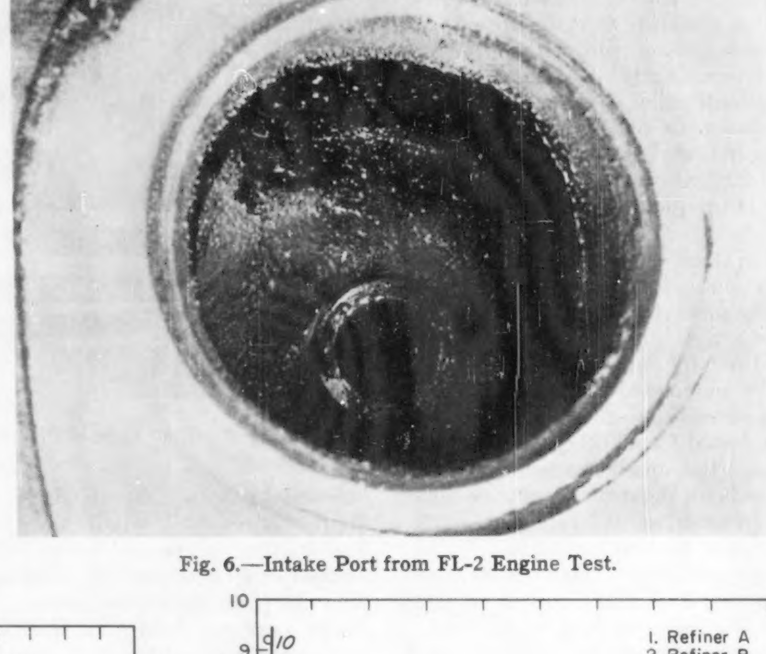


Fig. 6.—Intake Port from FL-2 Engine Test.

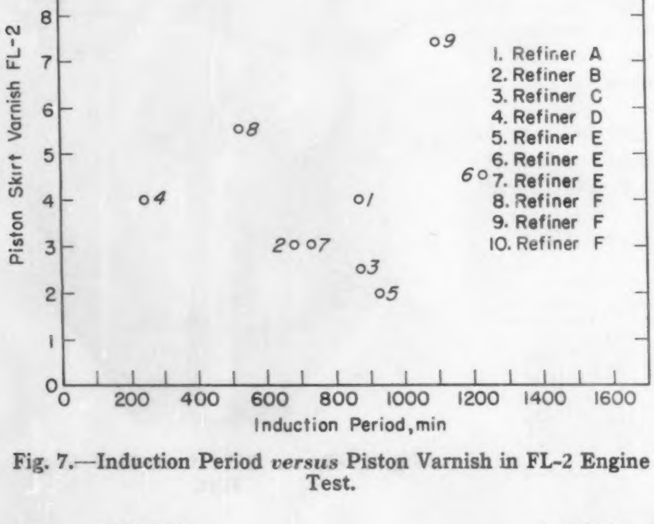


Fig. 7.—Induction Period *versus* Piston Varnish in FL-2 Engine Test.

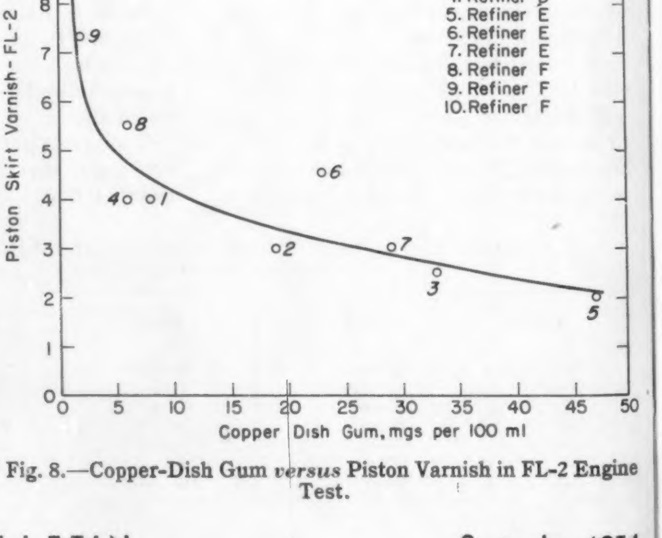


Fig. 8.—Copper-Dish Gum *versus* Piston Varnish in FL-2 Engine Test.

The very heavy varnish on the piston skirt shown in Fig. 4 should be observed. It is also worth noting the scratch lines which resulted from having to drive the pistons out of the cylinders. Figure 5 shows an intake valve and an exhaust valve from this FL-2 engine run. The heavy deposit on the intake valve is, in our opinion, due to gum formed from this fuel. Figure 6 further proves that this is a gummy gasoline as considerable varnish or lacquer has formed in the *intake-port*.

Since the field and laboratory investigations of this trucking company complaint both showed that gum from the gasoline was causing the difficulty, it is of interest to note that the induction period of this gasoline at the time of sampling was 930 min. If an induction period result is to mean anything to a refiner, 930 minutes surely should indicate satisfactory stability, yet field investigation and laboratory engine tests revealed excessive gumming. As a matter of interest, it is worth noting that the existent gum was 5 mg per 100 ml which is slightly high, but still not in itself predictive of trouble. The copper-dish gum, however, was 47 mg per 100 ml, and this, in our experience, is too high and *can* mean trouble.

Figure 7 shows the correlation of induction period with engine cleanliness as typified by the FL-2 piston-skirt varnish ratings of various commercial gasolines. Obviously, no curve can be drawn through these scattered points, so this is something else the induction period cannot do.

Figure 8 is presented with some reluctance since most refiners, including ourselves, have long looked on the copper-dish gum method with disdain. It was with surprise therefore that we found that a rather good curve could be drawn to correlate the copper dish gum with FL-2 engine cleanliness. It will be interesting to see whether others can verify this finding.

If a conclusion is to be drawn from this paper it will necessarily concern the nondependability of the induction period. As a matter of fact, the entire paper has been aimed at justifying the deliberately ambiguous title "The Invalid Induction Period." This title was chosen since in'va-lid means "sickly, unhealthy" while in-val'id means "of no force or cogency." It is suggested therefore that the reader take his choice as to which of these definitions is the more appropriate.

Acknowledgment:

The author expresses thanks to H. E. Luntz of the Continental Oil Co. who was kind enough to allow the inclusion of some of his company's data taken from a field storage program.

Correlation of Induction Tests with Motor Fuel Stability

By R. W. Donahue

The relationship between induction period tests and storage stability is affected by fuel composition, tetraethyllead content, and antioxidant type. With a knowledge of effect of these variables the induction test can be used to produce fuels with adequate storage stability.

CONSIDERABLE evidence has been presented to show that presently used accelerated tests are not adequate for predicting storage stability of motor fuels. Specifically, the induction period test, ASTM Method D 525,[1] which has been used for several years by refiners as a measure of the storage stability of his motor fuel products, stands accused as inadequate and misleading. Can a case be made in defense of the use of this test? In this paper an attempt will be made to defend the proper use of induction period tests as a measure of storage stability.

At the WPRA Regional Technical Meeting in Beaumont, Tex., in February, 1952, a paper[2] was presented by Bender, Lauson, and Kernen of E. I. du Pont de Nemours & Co., Inc. suggesting that induction period tests on present-day gasolines were not indicative of storage stability. From the point of view of a refiner who is using this test as one measure of motor fuel stability, this was disconcerting. We decided to take a closer look at the individual fuels used in the du Pont study, analyzing the data from the refiner's viewpoint. What our analysis showed is the basis for this paper.

The du Pont work was done on six different motor fuel blends. The composition of these blends is shown in Table I. The composition covers a wide range of concentrations of catalytic, thermal, and straight-run gasolines supplied by several refiners. Various concentrations of inhibitors, tetraethyl lead, and metal deactivator were added to these fuel blends. They were then submitted to conventional accelerated gum tests including induction period.

The samples were subjected to moderately accelerated storage conditions of 110 F as well as to room-temperature storage. Unfortunately, at the time the du Pont paper was written, the room-temperature tests were not complete. In referring to the room-temperature storage, the statement was made at the time that "there does appear to be a satisfactory correlation with the results obtained at 110 F." For the purpose of this discussion the "10-mg gum time"—the time in weeks at 110 F required to form 10 mg of gum per 100

TABLE I.—COMPOSITION OF BLENDS.

Blends	Component, vol, per cent					
	A	B	C	D	E	F
Straight run	30	20	57	40	22	17
Catalytic cracked	47	36	30	30	46	75
Thermal cracked	15	29	13	30	32	5
Polymer	8	..	..	..	..	..
Natural	..	15	..	..	..	..
Thermal reformed	..	..	..	..	..	3

R. W. DONAHUE, Chief, Field Development Section, Research and Development Dept., Sun Oil Co., Marcus Hook, Pa. has specialized in reciprocating and jet engine fuel research.

NOTE.—DISCUSSION OF THIS PAPER IS INVITED, either for publication or for the attention of the author. Address all communications to ASTM Headquarters, 1916 Race St., Philadelphia 3, Pa.

[1] Method of Test for Oxidation Stability of Gasoline (Induction Period Method) (D 525-49), 1952 Book of ASTM Standards, Part 5, p. 224.

[2] Bender, Lauson, and Kernen, "Stability of Present Day Gasolines," presented at WPRA Regional Technical Meeting, Beaumont, Tex., February, 1952.

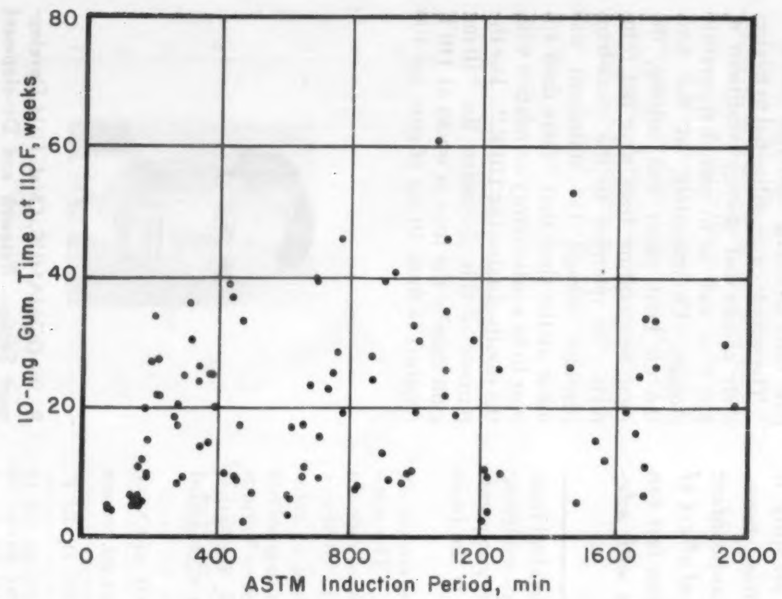


Fig. 1.—Correlation of Induction Period and Gum Time, All Blends.

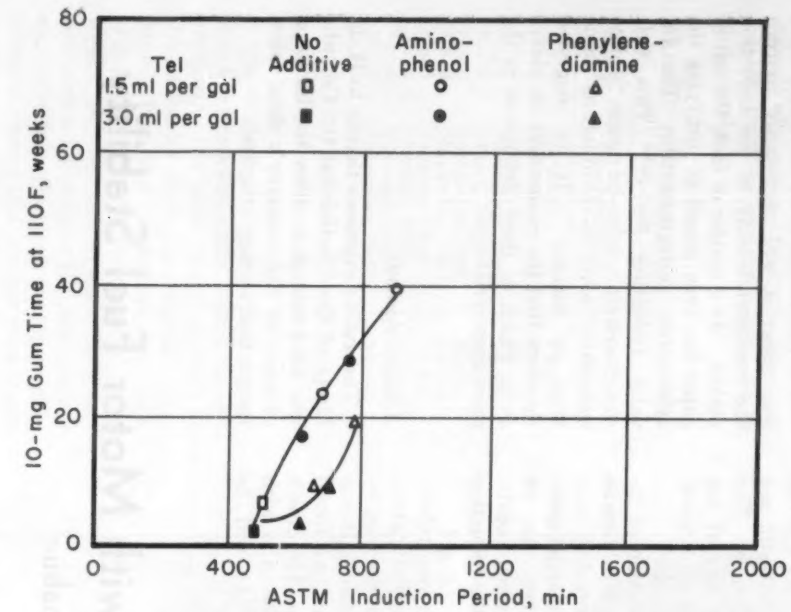


Fig. 2.—Correlation of Induction Period and Gum Time, Blend A.

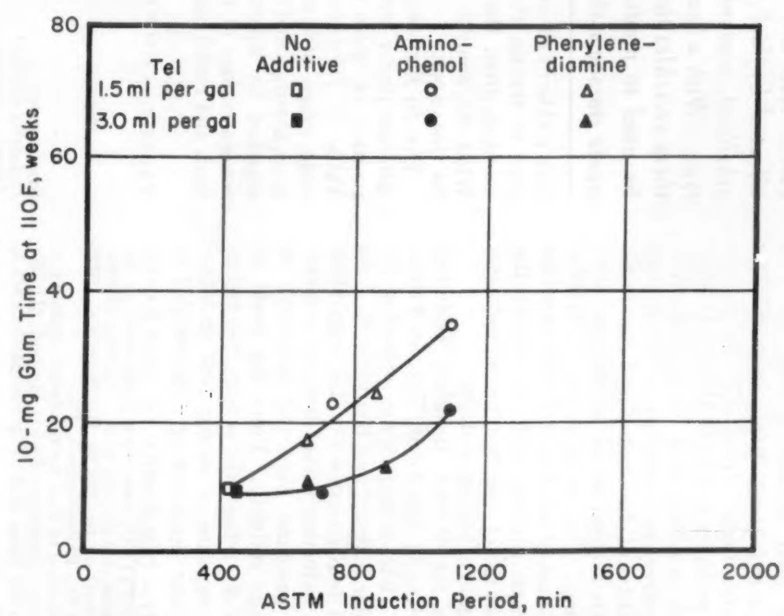


Fig. 3.—Correlation of Induction Period and Gum Time, Blend B.

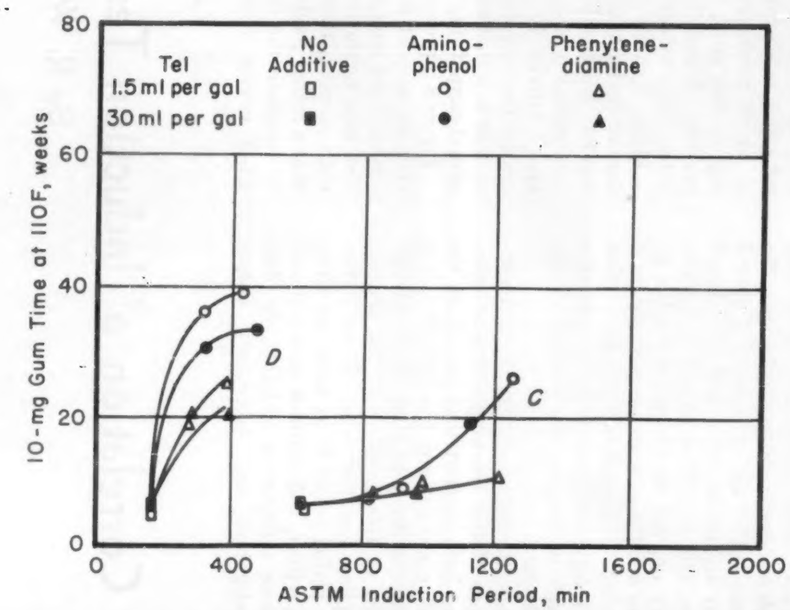


Fig. 4.—Correlation of Induction Period and Gum Time, Blends C and D.

ml of gasoline—has been used as a measure of storage stability.

The 10-mg gum time data obtained on all six fuels with various concentrations of inhibitors, metal deactivator, and TEL have been plotted against induction period in minutes in Fig. 1. The shotgun pattern obtained suggests that no correlation exists between induction period and 10-mg gum time. And this is a case in point against the use of the induction period.

But let us examine the data for the individual fuels. In Fig. 2 we have plotted the 10-mg gum time against induction period data for the samples of fuel A containing tetraethyl lead. The unleaded samples were actually treated in our analysis but have been eliminated here for simplicity. We asked ourselves what these data would mean to us if we were the refiner of blend A. For one thing, they indicate that, in interpreting induction period data, inhibitor type must be taken into account; the samples containing aminophenol inhibitor fit the upper curve in Fig. 2 while those containing phenylenediamine fit the lower curve. TEL concentration does not affect either correlation appreciably.

The refiner of blend B has a different relationship between 10-mg gum time and induction as shown in Fig. 3. In contrast to blend A, a change in inhibitor type in blend B does not affect the correlation. However, changes in TEL concentration do have an effect. The upper curve in Fig. 3 represents the samples containing 1.5 ml TEL per gal and either inhibitor type. The lower curve is for the sample with 3.0 ml TEL per gal and either inhibitor. It is particularly interesting to note that the effect of increasing the concentration of TEL is to decrease the 10-mg gum time at 110 F without changing the induction period.

The data for blends C and D have been plotted in Fig. 4. The curves for blend D shown at the left of the chart indicate that both TEL content and inhibitor type affect the correlation between induction period and 10-mg gum time. The upper pair of curves represent the samples containing aminophenol type inhibitor while the lower pair represent the samples containing phenylenediamine type inhibitor. The upper curve of each pair correlates the

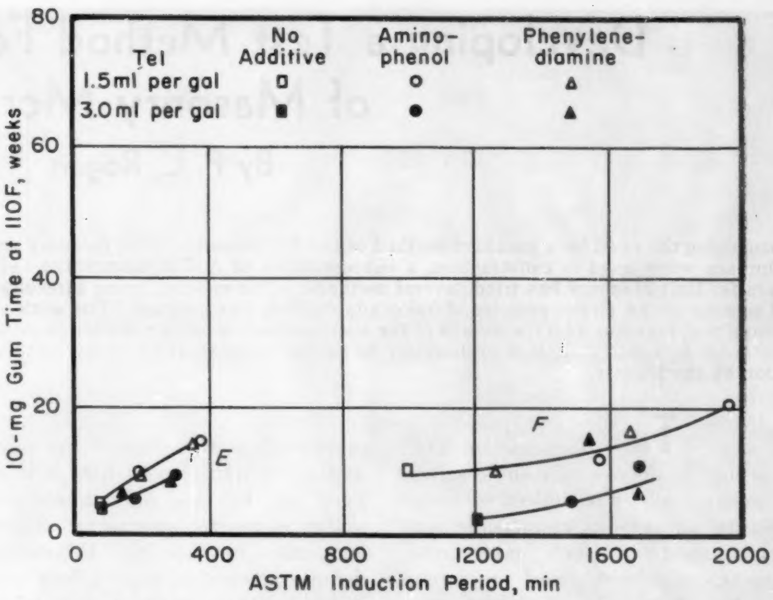


Fig. 5.—Correlation of Induction Period and Gum Time, Blends E and F.

samples containing 1.5 ml TEL per gal. In this case inhibitor type is again the more important variable to be considered. Since the refiner is probably using only one inhibitor type, storage stability of his fuel will vary only with changes in TEL content.

Blend C represents another interesting case. At the lower inhibitor concentrations, there is very little to choose between inhibitor types. However, at higher concentrations, the aminophenol type gives better stability for a given induction period than the phenylenediamine type. Changes in TEL concentration do not affect the correlation curves.

The correlations of induction period with 10-mg gum time for blends E and F are shown in Fig. 5. Blend E exhibits a relationship similar to blend B in that its correlation is affected by TEL content rather than inhibitor type.

The refiner of blend F has an interesting problem. This fuel, which contains 75 per cent catalytic gasoline, exhibits quite high induction periods for only moderate 10-mg gum times. This suggests that the mechanism of deterioration measured by induction period is not the principal mechanism by which blend F deteriorates in storage. However, the induction period gives some measurement of stability as indicated by the slope of the two curves. This fuel is similar to blends B and E in that TEL content affects the correlation more than inhibitor type.

This discussion has pointed out that for the six different fuels studied, there is no general relationship for all fuel types between induction period and 10-mg gum time. However, it has been shown that for each fuel there is a usable relationship by which induction period may be used as a measure of storage stability. This is not to say that the refiner can get along without field experience and data. He must establish satisfactory storage-stability levels by field experience and then correlate them with laboratory tests.

The large variation in storage stability between fuels with the same induction period suggests that gum is formed from a variety of reactions and mechanisms and that the induction test measures some of these reactions or mechanisms. This leads to the speculation that several different tests may be required to predict adequately the storage stability of all types of fuel. It is the purpose of this paper to suggest that the induction test, if properly applied and interpreted, is a useful means of measuring the stability of motor fuels.

Developing a Test Method For Efflorescence of Masonry Mortar

By P. L. Rogers

Recognizing the need for a standard method of test for the tendency of masonry mortar to effloresce when used in construction, a subcommittee of ASTM Committee C-12 on Mortars for Unit Masonry has tried several methods. One method, using carefully prepared ceramic wicks, shows promise of being adaptable to this purpose. The work of the subcommittee, together with the details of the wick method, is being reported as information in order to solicit comment preliminary to further consideration of the method for adoption by the Society.

THE phenomenon of efflorescence, a deposit of soluble salts, on masonry walls is a subject of keen interest to all persons responsible for materials used in such structures. Architects, engineers, and research organizations have been searching for an understanding of the phenomenon and for ways of avoiding it. ASTM Committee C-12 on Mortars for Unit Masonry established a Subcommittee on Efflorescence several years ago. Cooperative tests, on the tendency of masonry mortars to effloresce, were started in 1947 and have been going on intermittently ever since.

Early Tests

In the first series of tests, three brands of masonry cements and one well-known commercial masonry sand were used in testing for efflorescence by two methods. One method followed was that of forming 2 by 4-in. mortar cylinders, which, after an initial curing period, were stood on end in shallow water with the top, as cast, placed in the water. It was thought that any soluble salts that might cause efflorescence would migrate through the porous mortar and crystallize on the upper part of the mortar cylinder. As a comparative group black pigment was incorporated in the mortar used in forming some of the mortar cylinders, the thought being that the darker mortar would provide a better condition for observing any efflorescence. Sodium sulfate was used in some of the mortar cylinders. As a second method, Efflorwicks (see Appendix), a development of the Ceramic Research Department of New York State College of Ceramics, were used to detect efflorescence.

The tests, conducted under two different conditions of storage during the winter of 1947–1948, by four laboratories, showed no definite preference of reliability of either method. Lack of agreement as to rating of the cements and as to results was due, at least in part, to: low and nonuniform permeability of mortar specimens; failure to evaporate through the Efflorwicks a definite amount of water; lack of control or too little air circulation; and lack of control for temperature and humidity.

Later Tests

To foster a better understanding of the nature of the problem, F. O. Anderegg, a member of the subcommittee, wrote an article on efflorescence which was published in the ASTM BULLETIN,[1] October, 1952. Following the appearance of this article, two additional laboratories joined in the program, and a new group of tests was started. Samples of nonstaining masonry cement, commercial masonry sand, and black pigment were distributed to the testing laboratories. Again the tests were made using 2 by 4-in. mortar cylinders, both plain and pigmented, and better control was exercised in mixing and curing. Efflorwicks again were used. Sodium sulfate was added in varying amounts both to the mortar in the cylinders and to the mortar specimens with the Efflorwicks. Since the cement was composed essentially of interground hydrated lime and pozzolanic slag, this sulfate was considered suitable for use as a soluble salt in these tests.

Outline of Mortar Cylinder Test Method:

In all tests, the method of mixing mortar was that described in ASTM Method C 91 – 53,[2] Section 23(*b*), insofar as applicable. The mix and batch proportion of plain mortar was:

400 g cement (80 lb per cu ft),
1200 g sand (80 lb per cu ft, air dry), and
265 ml distilled water.

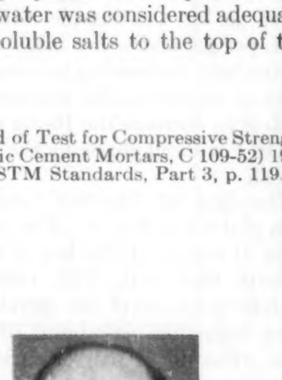
For the pigmented mortar, 35 g of black pigment were added to the above size batch and 285 ml of water were used. This gave a flow of 100 to 115 as determined by ASTM Standard C 109 – 52.[3] Three cylinders each were made of plain and colored mortar without sodium sulfate, and three each using 0.1, 0.2, and 0.5 per cent sulfate based on the weight of cement. The mortar was puddled in three layers in dry, clean, cylindrical molds, stored for 48 hr in the moist closet (70 F, 95 per cent relative humidity), removed from the molds, and then stored another 24 hr in a moist closet before starting wick action. Because of the slow setting of the cement, difficulty was experienced by some of the laboratories in removing specimens from the molds; but by storing in air this difficulty was overcome. Tests for efflorescence were made by inverting the cured mortar cylinders separately in crystallizing dishes, 125 by 65 mm in size. Distilled water was added (150 ml) to the dishes, and the dish and cylinder were covered with a snug-fitting rubber membrane so that about $2\frac{1}{2}$ in. of the cylinder protruded through the membrane, thereby forcing all evaporation to take place through the protruding cylinder. Evaporation of 500 ml of water was considered adequate to carry soluble salts to the top of the cylinder.

NOTE.—DISCUSSION OF THIS PAPER IS INVITED, either for publication or for the attention of the author. Address all communications to ASTM Headquarters, 1916 Race St., Philadelphia 3, Pa.

[1] F. O. Anderegg, "Efflorescence," ASTM BULLETIN, No. 185, October, 1952, p. 39 (*TP 155*).

[2] Specifications for Masonry Cement, (C 91-53) 1953 Supplement to Book of ASTM Standards, Part 3, p. 9.

[3] Method of Test for Compressive Strength of Hydraulic Cement Mortars, C 109-52) 1952 Book of ASTM Standards, Part 3, p. 119.



P. L. ROGERS since 1932 has been with the Riverton Lime and Stone Co., Riverton, Va. as plant chemist and now as director of research. During this period he has represented his company in ASTM and has been active in several committees.

Mortar Cylinder Results:

As in the earlier tests, results were entirely unsatisfactory due to the low permeability of the mortar. In some instances, exfoliation of the cylinder tops occurred with the 0.5 per cent sodium sulfate addition, while other cylinders of the same mix showed no change. One laboratory ran extensive series of tests to check the rate of water transpiration under different conditions. A cement composed of 50:50 blend of low-alkali white cement and finely ground limestone was used by this laboratory with 20–30 and 30–100-mesh Ottawa sand in the proportions of 1:3 and 1:4 by weight. Curing was tried for different periods of time, both in the moist closet and in air, with molds untreated, coated with Petrolatum, and coated with oil. With all of these variables, the best transpiration was found with a 1:4 mix, using 30–100-mesh sand, with specimens air cured. Even then it took 4 weeks to evaporate 500 ml of water.

Efflorwick Tests:

Four of the laboratories using the Efflorwick procedure in testing nonstaining cement with variable amounts of sodium sulfate had more favorable results. The following is the typical procedure of these four laboratories:

Method.—Four mortar mixtures were prepared (Table I) and five specimens were tested from each mortar. As a control group, four blank samples containing Efflorwicks and distilled water only were also tested. The mortars were mixed in accordance with ASTM Specifications C 91[2]; from each mortar five jelly-glasses were partially filled by weighing into each glass one fifth of the mortar batch. The inside of the jelly glass may be coated with Petrolatum—not mineral oil—to facilitate removal of mortar at the end of the test. The Efflorwick was inserted down into the mortar until it touched the bottom of the glass. The mortar was aged for 2 hr; then 50 ml of distilled water were placed on its surface, and a snug-fitting rubber membrane, slotted to permit exposure of the upper portion of the Efflorwick, was attached. The specimens were then placed in a room at 70 ± 2 F and 50 ± 5 per cent relative humidity, to allow all excess water to evaporate through the wick.

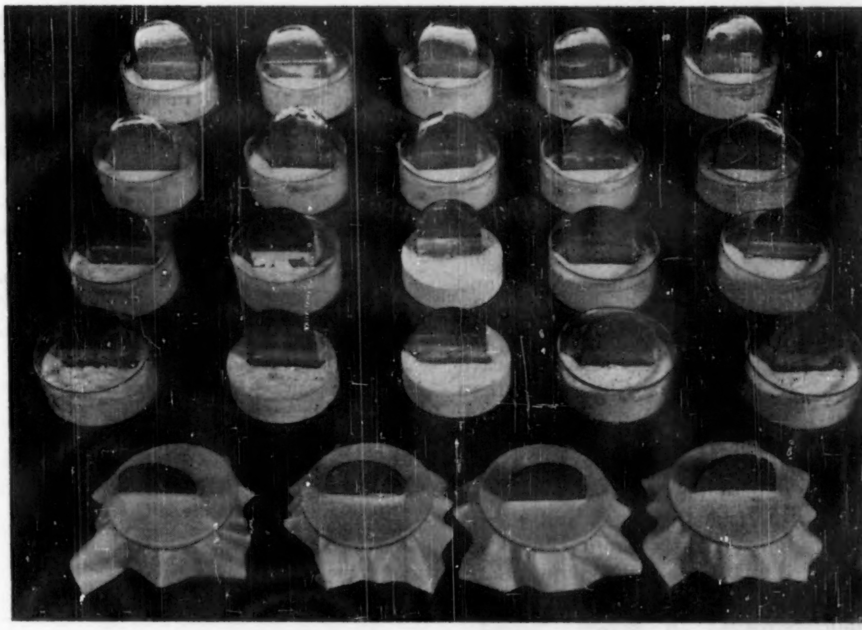


Fig. 1.—Efflorescence Tests with Efflorwicks.

Observations.—The following observations were made at various ages: At 4 hr there was visible efflorescence on four of the five mortar D specimens. At 24 hr all five D specimens had heavy efflorescence with fronds extending out as much as $\frac{1}{16}$ in. Four of the five mortar C specimens showed strong efflorescence. One B specimen showed a trace of efflorescence. At 48 hr all C and D specimens showed strong efflorescence with a trace on one of the B specimens. At 5 days there was no apparent change, but water was completely evaporated from around 21 of the 24 specimens (two of the A and one of the B still contained a little water). At 8 days all specimens were dry, so the membranes were removed, and the specimens were placed in an oven at 80 C to dry overnight. After drying and cooling, the specimens were photographed.

The bottom row of four specimens, the control group in Fig. 1, contains no mortar, only distilled water. The second row of specimens was made with mortar A and contain no sulfate. In the third row showing the five specimens made with 0.1 per cent sodium sulfate additive, the middle specimen shows definite efflorescence; the other four are questionable. The fourth and fifth rows are the specimens with 0.2 and 0.5 per cent sodium sulfate, respectively. All specimens in these two upper rows have very pronounced efflorescence. A white deposit appears on many of the specimens below the membrane line. This is believed to be due to creep of the solution, which presumably is saturated with calcium hydroxide. A film of calcium carbonate will form on the surface of the supernatant liquid since it is exposed to air. As the surface recedes, this film may be drawn to the wick and adhere there. This deposit below the line of the membrane is not efflorescence, but it might be interpreted as such unless specifically described and exempted in a specification.

TABLE I.—MORTAR PROPORTIONS.

	Cement, g	Sand, g	Distilled Water, g	Na_2SO_4, g
Mortar A......	250	750	165	0
Mortar B......	250	750	165	0.25
Mortar C......	250	750	165	0.50
Mortar D......	250	750	165	1.25

Commercial Masonry Cement Tests:

One of three laboratories using Efflorwicks in testing commercial brands of masonry cements reported that three cements gave a slight efflorescence corresponding to the results obtained, by other members of the subcommittee, with 0.1 per cent sodium sulfate addition to the nonstaining cement. This laboratory reported that a fourth masonry cement developed efflorescence comparable to that using 0.2 per cent sodium sulfate with the nonstaining cement.

Another of the three laboratories reported using the Efflorwicks to test four commercial cements and one special cement, using four commercial masonry sands. The special cement was a laboratory product, very fast setting, having high early strength, and containing sulfate equivalent to 8 per cent sulfuric anhydride. The water-soluble alkalies were determined on these five cements, the results of which are given in Table II.

TABLE II.—SOLUBLE ALKALI.

Cement	Sodium Oxide, per cent
No. 1	0.34
No. 2	0.14
No. 3	0.08
No. 4 (special)	0.39
No. 5 (nonstaining)	0.02

Efflorwick tests were made using mortars made from cement No. 1 and each of the four commercial sands. The efflorescence developed by the four mortars was nearly the same in each case. It was considerably more than that produced by 0.1 per cent sodium sulfate with nonstaining cement but somewhat less than that produced with 0.2 per cent sodium sulfate. Efflorwick tests with cements Nos. 3 and 4 gave efflorescence slightly more than that produced by 0.1 per cent sodium sulfate. Cements Nos. 2 and 5 gave the least efflorescence.

The third laboratory summarized its findings by stating that it had been unable to obtain consistent results in a series of consecutive tests with Efflorwicks on samples of two masonry cements that contained different amounts of water-soluble constituents. Tests in that laboratory indicated no difference between the specimens placed under test after 2-hr curing and after 24-hr curing. Later this laboratory reported that when the tests were continued with additional 50-ml portions of distilled water an appreciable amount of efflorescence appeared on the wicks. This was discernibly heavier in the case of the cement containing 0.22 per cent soluble alkali, although after three additional portions of water had evaporated, there was a considerable deposit on the wick in the mortar containing only 0.03 per cent soluble alkali. Chemical analyses were run on the efflorescence from the two cements. Table III summarizes the principal components of the two efflorescence samples.

TABLE III.—PRINCIPAL COMPONENTS OF EFFLORESCENCE SAMPLES IN PER CENT.

	High Alkali	Low Alkali
CaO	13	4
SO_3	2	3
K_2O	39	12
Na_2O	8	46
Loss	36	38
CALCULATED PROBABLE COMPOSITION		
K_2SO_4	4	8
K_2CO_3	54	12
Na_2CO_3	13	79
$CaCO_3$	23	6

SUMMARY

Repeated tests with mortar cylinders failed to produce satisfactory results, primarily because of low permeability which prevented sufficient wick action. Tests with Efflorwicks gave consistent results when used in testing mortars composed of a nonstaining cement and varying amounts of sodium sulfate. Efflorwick tests on mortar made from commercial brands of masonry cements generally showed greater efflorescence with those cements having higher soluble alkali content, although the efflorescence was not always proportional to the amount of alkali present. One special cement, very high in sulfates and moderately high in alkalies, did not exhibit exceptionally high efflorescence. It was found that additional applications of water to Efflorwick tests increased the amount of efflorescence brought to the surface. Chemical analyses showed that the efflorescence was probably composed mainly of alkali carbonates with a lesser amount of alkali sulfate and calcium carbonate.

It is believed that the Efflorwick method offers a good basis for a method of test for the efflorescing tendency of masonry mortars. Several good suggestions for improving the test method have been made as follows:

1. Wetting the wicks with distilled water before inserting in the mortar, thus securing better contact.
2. Forming a collar of mortar around the wick in order to secure more contact and cause the water to be drawn from and through the mortar to the wick.
3. Using more water for greater wick action.
4. Using a grid system for estimating the amount of efflorescence and putting the amount in terms of numbers instead of the terms "little," "medium," and "heavy."

Acknowledgment:

Cooperating laboratories were New York State College of Ceramics; Louisville Cement Corp.; Lehigh Portland Cement Co.; F. O. Anderegg, Consultant; Department of Building Engineering and Construction, Massachusetts Institute of Technology; and Riverton Lime and Stone Co.

APPENDIX

THE USE OF THE EFFLORWICK

Description:

In order to test efflorescence resulting from certain cements, limes, sands, etc., in brickwork, standardized wicks having the same pore structures can be used so that tests conducted in laboratories in different portions of the country will be comparable. Such a standard wick would be necessary in any wick test for efflorescence caused by mortars. The Ceramic Experiment Station of the New York State College of Ceramics has developed such a wick made of purified brick clay known as "Efflorwick." These wicks are made as nearly identical as it is possible to produce them; hence the efflorescence tendencies of different materials may be accurately compared.

Efflorwicks are rectangular tiles with a rounded top. The dimensions are approximately 1⅞ in. wide, 2¾ in. high, and ½ in. thick. Made by special preparation of a red-firing clay, these specimens are free from self-contained efflorescing salts. The red color of the Efflorwick makes an ideal background for visually estimating the degree of efflorescence, and the pore structure is such as to promote rapid capillary flow of water solutions through the wick.

The wicks come wrapped in paper and should be stored in a clean dry place until ready for use.

Procedure for Testing Mortars:

Fifty grams of the mortar mix are tempered with distilled water for each test. Any soluble additives, such as sodium sulfate, can be dissolved in the tempering water. The mortar thus prepared is added to a ½-pt jelly glass, about 3 in. in diameter and 2 in. in height, and the wick, rounded end up, is pushed down into the mortar until it touches the bottom of the glass. The inside of the jelly glass can be coated with Petrolatum—not mineral oil—so that the mortar may be removed at the end of the test.

After the mortar has cured for 24 hr, 50 ml of distilled water are added, and a cover is placed over the glass. This cover should be designed to prevent evaporation of the liquid except through the exposed portion of the wick, and to keep foreign material from contaminating the test.

The test is conducted at a temperature of 73 ± 3 F at a relative humidity of 50 ± 5 per cent until the 50-ml portion of water has evaporated through the wick, then the cover is removed and the specimen placed in a drier at 80 C until dry.

After drying, the salts of efflorescence are visually examined and described. The relative amounts of efflorescence appearing on the wick are rated as none, slight, medium, and heavy. Photographs of the completed test are helpful in correlating results.

For each mortar, five duplicate tests with five glasses and wicks should be run simultaneously. Along with each set of five tests, one control test should be conducted using only the 50-ml portion of distilled water and an Efflorwick in the glass.

The Bookshelf

Gmelin's Handbook of Inorganic Chemistry

8th Ed. (in German). Edited by the Gmelin Inst., Verlag Chemie, Weinheim, W. Germany

No. 3. *Oxygen*, Sect. 2—Occurrence, Technology (Literature up to 1950), pp. 83–300.

No. 9 *Sulfur*, Part A, Sect. 2—Occurrence, Technology, of Sulfur and Its Compounds, Colloidal Sulfur, Physiological (Literature up to 1950), pp. 61–510. Part B, Sect. 1—Hydrides and Oxides of Sulfur (Literature up to 1950), pp. 1–368.

No. 27 *Magnesium*, Part A, Sect. 4—Alloys of Magnesium with Zinc. . .Rhodium. Surface Treatments (Literature through May, 1942, and December, 1949), pp. 483–818.

No. 41 *Titanium* [complete]—Dedicated to Roger Adams (Literature up to 1950), pp. 1–481.

In a day when increasing specialization robs co-workers in the same branch of science of the ability to converse intelligently about one another's work, the Gmelin Handbook stands as a monument to the unity of science. Although it is nominally a publication for the inorganic chemist, it serves equally well as a source book for the metallurgist, the ceramist, the physicist, the geologist, and the biologist, not merely to inform them on subjects germane to the field of chemistry, but on matters of specialized interest to the particular field of each.

The reviewer of any part of the Gmelin Handbook has a particularly difficult task. To those readers who are acquainted with this excellent compendium, it is enough merely to indicate the parts which have appeared for them to realize that another first class reference tool has been added to scientific literature.

To those who are not acquainted with the Handbook he must try to suggest the vast store of information—as nearly "complete" as we are ever likely to find—on each topic treated. He must point out that in spite of the complexity of the information supplied, it is so well organized that after a small exercise of use, it is almost always possible to pinpoint the spot where a given bit of information should be so that one can instantly discover the data sought, or return the volume to the shelf with the knowledge that the particular information in question has never appeared in print, at an earlier date than the particular part of the Gmelin consulted.

American users of scientific literature are often too ready to accept the false assurances that it is unnecessary any longer to learn German or for that matter any foreign language to work in science. The existence of the Gmelin alone is an eloquent argument to the contrary. However, the knowledge of German necessary to use indices and to locate information in this Handbook is truly minimal. Once the information is located, it will be expressed in the universal language of numbers, or in succinct German sentences which present none of the familiar difficulties of unraveling.

It is a pleasure to notice the steady growth of this valuable compendium as exemplified by the volumes noted above. May they receive the support they deserve, and appear with accelerated speed.

S. E. Q. Ashley

• • •

Silicones

R. R. McGregor. McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York, N. Y., 302 pp., $6

In this volume the author has endeavored to provide in nontechnical language an over-all picture of what silicones are and to show how they can be used. It is intended as a practical manual for engineers, designers, and others who wish to use silicones, correlating the available information on properties, preparation, and applications. Commercial types covered include silicone fluids, compounds, lubricants, resins, rubber, and "bouncing putty."

The five chapters are entitled: (1) History of Silicones, (2) Commercial Silicones, (3) Physiological Response to Silicones, (4) Applications of Silicones of Specific Industries and Cost Considerations, (5) Chemistry of Silicone Preparation. The volume also includes an index and bibliography.

• • •

Technical Memoranda on Concrete

Waterways Experiment Station, Corps of Engineers, U. S. Army, P. O. Box 631, Vicksburg, Miss.

These three technical reports furnish interesting data on tests completed by the Concrete Research Division of the Station.

Technical Memorandum No. 6-226 includes Report No. 5, which is a summary of results for the period 1936–1953 on the investigation of durability of concrete exposed to natural weathering. Part I gives information on the several weathering exposure stations and the test methods involved in the investigation. Part II presents the programs of investigation, of which there were a considerable number. Included in the various programs were the investigation of natural cement, neutralized vinsol resin, admixtures, membrane curing, vacuum concrete, other programs of equal interest and a bibliography Price: $1.

Technical Memorandum No. 6-330 is entitled "Permeability and Triaxial Tests of Lean Mass Concrete." The descriptions of the test programs for permeability and for triaxial testing include details on specimens, equipment, test procedure, and results of tests. There is an appended report on permeability, pore pressure, and uplift in gravity dams. Price: $1.

Technical Memorandum No. 6-383 presents Report No. 1 of the 1953 Field Soniscope Tests of Concrete. This report presents information on the location of reading stations and the schedule, apparatus, and test method used. An appendix presents a Proposed Tentative Method of Test for the Measurement of the Pulse Velocity of Propagation of Elastic Waves in Concrete. Price: 50¢.

• • •

Residual Stresses in Metals and Metal Construction

Reinhold Publishing Corp., 330 W. 42nd St., New York 36, N. Y., 376 pp., $10

This monograph was prepared by the Committee on Residual Stresses of the National Academy of Sciences, National Research Council, as a survey for the Ship Structure Committee. The main body of the monograph consists of papers contributed by some 20 experts. The scope of the work is broad—the origin, magnitude, distribution, etc., of all types of residual stresses existing in a structure or a machine whether they arose from welding, machining, or any other cause. The editor is W. R. Osgood, Professor of Mechanics, Illinois Institute of Technology, and the 22-page summary at the back of the book was prepared by the editor and the Committee on Residual Stresses.

• • •

Characteristics and Applications of Resistance Strain Gages

***NBS Circular* 528, U. S. Government Printing Office, Washington 25, D. C., 140 pp., $1.50**

This symposium is one of the twelve held as part of the National Bureau of Standards' fiftieth anniversary program in 1951.

The papers represent some of the latest experimental and theoretical results in the study of resistance strain gages here and abroad.

Procedures in Experimental Metallurgy

A. V. Seybolt and J. E. Burke, John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y., 352 pp., $7

THE primary aim of the authors, A. U. Seybolt and J. E. Burke of the Research Laboratory and the Knolls Atomic Power Laboratory, respectively, of the General Electric Co., is to describe most of the important laboratory techniques that are now used in the preparation of metals and alloy specimens for further study. The 352 pages are replete with line drawings of experimental laboratory apparatus. Investigational techniques such as microscopical examination, X-ray diffraction methods, thermal analysis, and mechanical testing are purposely omitted since there are satisfactory monographs on these subjects. Special chapters on powder metallurgy and single crystal preparation are included. The chapter on powder metallurgy is a concise useful exposition of the methods of powder metallurgy as applied to the preparation of samples in the laboratory.

• • •

Fabricated Materials and Parts

T. C. Du Mond. Reinhold Publishing Corp., 330 W. 42nd St., New York 36, N. Y., 338 pp., $6.50

COVERING 20 major methods for making small industrial parts, the book was written by the editor of *Materials and Methods*, for the project or materials engineer, the purchasing agent, and the company executive. Profusely illustrated, it discusses such important considerations as costs, materials used, advantages, limitations, design factors, and the sizes and tolerances possible with each method. Of specific interest to the nonspecialist are the introductory chapters discussing the relationship between all the major production factors which enter into a practical decision.

• • •

Ferrous Process Metallurgy

John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y., $6.50

THE author of this college textbook, Professor John L. Bray of Purdue University, has had two editions and several revisions of experience in an earlier publication as a background for the present publication. Statistical material is kept at a minimum and photographs eliminated. Simple line drawings avoid the multiplicity of detail involved in working drawings.

Many of the author's friends and former associates in industry contributed freely in material and suggestions. The subject matter can be covered in a junior or senior course meeting three or four hours a week for a sixteen-week semester.

Characteristics and Applications of Resistance Strain Gages

Proceedings of Symposium, November, 1951, National Bureau of Standards, *Circular 528*, U. S. Government Printing Office, Washington 25, D. C., 140 pp., $1.50

THE papers presented at this symposium represent some of the latest results, both experimental and theoretical, in the study of resistance strain gages by many leading institutions in the United States and abroad.

Though resistance strain gages are a comparatively new tool in the study of materials and structures, they have consistently found wider use in measurement of mechanical quantities such as acceleration, impact force, and dynamic pressure. They have been applied as the sensing element in a multitude of instruments, and have been used to determine strain distribution in structures, from airplane wings to bridges.

The eleven papers in this symposium covered these applications and also reported new work in progress on strain gages consisting of a conducting coating, applied by an evaporation technique, on special temperature compensated gages, on gages for strain measurements well beyond the elastic range, and on the application of strain gages to the determination of dynamic properties of materials and to the measurement of very large static forces.

• • •

Magnetic Fields of Cylindrical and Annular Coils

National Bureau of Standards, Applied Mathematics Series 38, Government Printing Office, Washington 25, D. C., 29 pp., 25 cents

THIS publication gives the axial and radial components of the magnetic field at any point in space of a cylindrical or an annular coil carrying an electric current. The results are expressed in terms of complete elliptic integrals or of Legendre functions which involve ratios of the significant dimensions of the coils.

In the past many formulas have been published which give the resultant effect of the magnetic field as either the inductance of such a coil or the force between two such coils when a known current exists in them. In contrast with this, the present publication gives a basis for computing in full detail the magnetic field itself, point by point. No formulas for this purpose have been readily available hitherto.

In experimental work it is frequently necessary to produce an accurately known magnetic field, and the use of one or more solenoidal coils of measurable dimensions is usually the most convenient way of accomplishing this. Possible applications range from the laying-out of large current-limiting reactors in electric power stations to the design of coils for studying paramagnetic resonance in atomic nuclei.

1948–1949 Bibliographic Survey of Corrosion

National Assn. of Corrosion Engineers, 1061 M & M Building, Houston 2, Texas, 346 pp., $12.50.

SUMMARIES of 3512 corrosion and corrosion prevention references published in 1948–1949 are compiled in this volume. Abstracts by 30 technical societies were canvassed regularly for material taken from more than 500 sources the world over.

The NACE Abstract Filing Index, formulated by experts in the field of corrosion over a period of several years, is used to classify the material topically. There are eight main groups in the NACE system: general, testing, characteristic corrosion phenomena, corrosive environment, preventive measures, materials of construction, equipment, and industries. Main groups are subdivided and topical cross-references are appended to each section.

The subject index, in addition to terms in the NACE Abstract Filing System, lists many metals and alloys by trade name and indexes them as to specific properties and to behavior in specific media. There are more than 2700 names in the author index; companies and associations are not listed. Referencing is to the classification and serial numbers of each abstract. These numbers and the reference data are emphasized by type style and arrangement. The appendix aids the user in locating and obtaining copies of unfamiliar foreign or domestic journals.

This is the third in a series of NACE bibliographies on corrosion literature. The preceding two volumes, covering 1945 and 1946–1947 respectively, contained 4448 abstracts.

• • •

Bibliography on Gas Turbines, Jet Propulsion and Rocket Power Plants

E. F. Fiock and C. Halpern, Supplement to *Circular* 509, 110 pp., 50 cents. Government Printing Office, Washington 25, D. C.

THE National Bureau of Standards in 1951 issued the original "Bibliography of Books and Published Reports on Gas Turbines, Jet Propulsion, and Rocket Power Plants" which contains a brief introduction on the classification and rating of jet engines and includes references on the status and future prospects, theory, and performance, materials and construction, and research programs in these fields. Some references are also given to papers on applications of nuclear power in this field.

The present supplement to *Circular 509* extends the period covered through December, 1953. Approximately 5000 additional references are listed, including some reports of earlier date that have been declassified since the publication of the original bibliography.

PERSONALS...

News items concerning the activities of our members will be welcomed for inclusion in this column

At the 41st Annual Convention of the American Electroplaters' Society in New York City in July, **Ralph A. Schaefer,** Vice-President, Clevite-Brush Development Co. (subsidiary of Cleveland Graphite Bronze Co.), was elected President. **Francis T. Eddy,** Assistant Plant Supt., Chase Brass & Copper Co., Waterbury, Conn., was elected a Vice-President. In August, AES announced re-election of **Earl J. Serfass,** head of Lehigh University Chemistry Department, as Chairman of the Research Committee of the Society. Other members elected to the Research Committee included **Robert J. Racine,** Wyandotte Chemicals; **Myron B. Diggin,** Hanson-Van Winkle-Munning; **Lloyd O. Gilbert,** Rock Island Arsenal (Ill.); **Arthur H. DuRose,** Harshaw Chemicals; **Edward A. Parker,** Technic, Inc., and **William Blum,** Consultant (Washington, D. C.). **Robert D. Miller,** of the Electric Auto-Lite Co., was included among recent appointments to the editorial board of *Plating*, the AES official publication.

The July 15, 1954 issue of *Metal Progress* is of particular interest since it gives the reports of 22 technical committees of the American Society for Metals which are intended to supplement the 1948 edition of the ASM Metals Handbook. There are many references in the reports to ASTM specifications and publications, for example, compositions of copper casting alloys, designations of magnesium and magnesium alloys, filler metal data, etc. Many ASTM members and committee members are active on ASM technical committees and on the ASM Metals Handbook Committee, a number serving as chairmen of various groups. These include—in addition to **Edgar O. Dixon,** current chairman of the Handbook Committee—Messrs. **William L. Badger, Hyman Bornstein, Howard C. Cross, Thomas E. Eagan, Russell Franks, M. L. Frey, T. A. Frischman, Bruce W. Gonser, Max A. K. Hansen, J. B. Johnson, Jack E. LaBelle, Robert H. Leach, George V. Luerssen, Don M. McCutcheon, Braly S. Myers, R. E. Peterson, N. E. Promisel, William A. Reich, Robert Sergeson, L. E. Simon, Ralph Thompson,** and **L. H. Winkler.**

Several ASTM members are among recently elected officers of the Malleable Founders' Society. At the Society's annual meeting in June in Montebello, Quebec, **Charles E. Brust** of the Eastern Malleable Iron Co. became President; **Carl L. Liebau,** of Federal Malleable Co., was named Vice-President; and Messrs. **Charles P. Speitel,** Pennsylvania Malleable Iron Corp., and **Leon J. Wise,** Chicago Malleable Castings Co., were elected Directors. The highest MFS award, presented annually in memory of Charles H. McCrea, former President of National Malleable & Steel Castings Co., went to **John A. Wagner,** Wagner Malleable Iron Co., for outstanding service to the malleable iron castings industry.

At the annual meeting of the Midwestern Air Pollution Prevention Assn., in Chicago in June, **Haldon A. Leedy,** Director of Armour Research Foundation of Illinois Institute of Technology, was re-elected President, to serve for his fourth year. **Gustav Egloff,** Universal Oil Products Co., was elected a Vice-President.

The following ASTM members have been elected to honorary membership in The American Society of Mechanical Engineers: **Henry Bigelow Oatley,** retired mechanical and consulting engineer of Great Neck, N. Y.; **Abbott Lawrence Penniman, Jr.,** Vice-President, Consolidated Gas, Electric Light and Power Co., Baltimore, Md.; and **George Leonard Sullivan,** Dean of the College of Engineering, University of Santa Clara.

Douglas E. Agren is now Vice-President, Industrial Wire Cloth Products Corp., Wayne, Mich.

W. E. Campbell, formerly with Bell Telephone Laboratories, has joined Brush Laboratories Co., Div. of Clevite Corp., as Director of Chemicophysical Research.

Harold C. R. Carlson, Design Consultant, New York City, and a Past-Chairman of the ASTM New York District, has been nominated a Director at Large of The American Society of Mechanical Engineers.

President Joseph F. Battley, of the National Paint, Varnish and Lacquer Association, Washington, D. C., recently announced the following changes in the Association's staff which will show continued improvement in the technical and scientific activities of the organization. **John C. Moore** was appointed Director of the Technical Division, and **Frank Scofield** is Assistant Director. The Scientific Section has been reorganized as an operating research facility. **George Sward** is the Director, with **Mark Westgate** as Chief Chemist, and **Ross Shurts** as Chief Chemical Engineer.

Robert W. Cline, formerly with Buffalo Pottery, Inc., is now Ceramist, Onondaga Pottery Co., Syracuse, N. Y.

Herbert K. Cook, until recently Chief, Concrete Research Div., U. S. Waterways Experiment Station, Jackson, Miss., has accepted a position as Assistant Director of Research, Master Builders Research Laboratories, Cleveland, Ohio.

Roy Dahlstrom, Director of Technical Department, National Lead Co. Titanium Division, was awarded a gold watch in recognition of 25 years' service with the company.

Van M. Darsey, President, The Tropical Paint & Oil Co., has been elected President of the Cleveland Paint, Varnish and Lacquer Assn.

Harmer E. Davis, Professor of Civil Engineering and Director, Institute of Transportation and Traffic Engineering, University of California, Berkeley, has been appointed Chairman of the Division of Civil Engineering.

Ray P. Dinsmore, Vice-President in Charge of Research and Development, Goodyear Tire & Rubber Co., Akron, Ohio, has been elected a term member of the Massachusetts Institute of Technology Corp. (governing body of the Institute). He will serve as term member for five years. Dr. Dinsmore recently was honored at special ceremonies in Akron to celebrate his 40 years of service with Goodyear. He has represented his company on ASTM Committee D-11 on Rubber and Rubber-Like Materials since 1926.

Lowell A. Dowds resigned June 25 as Deputy Chief of the Ordnance Packaging Office, Rossford Ordnance Depot, U. S. Department of the Army. He has been appointed Consultant on Packaging with the Foreign Operations Administration, for duty in Europe for a period of nine months.

Nelson E. Farley, Jr., formerly with Kaiser-Frazer Corp., Willow Run, Mich., is now Development Engineer, Chevrolet Motor Div., General Motors Corp., Detroit, Mich.

Arno C. Fieldner, Chief Fuels Technologist, U. S. Bureau of Mines, Washington, D. C., received the honorary degree of Doctor of Science from the University of North Dakota.

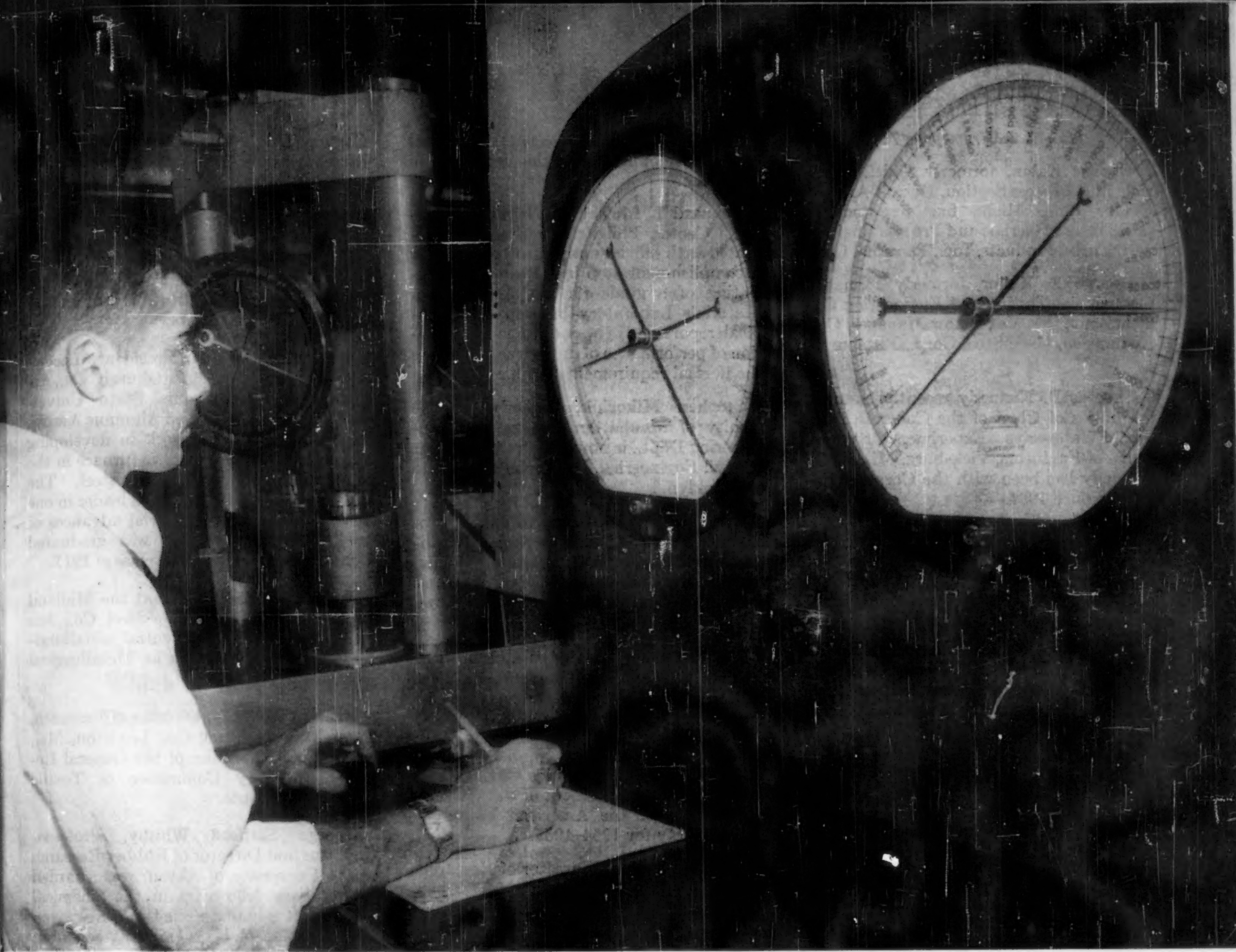
James Harold Foote, Vice-President, Commonwealth Services, Inc., New York City, and President and Chief Engineer in charge of its subsidiary, Commonwealth Associates, Inc., Jackson, Mich., has been elected a Director of the American Institute of Electric Engineers.

Ray C. Giddings is now Chief Engineer, River Industries, Inc., Seneca, Ill.

J. F. B. Jackson has relinquished his position as Director of the British Steel Castings Research Association, and is joining the Board of A.P.V.-Paramount Ltd. of Crawley, Sussex, England, as Deputy Managing Director.

Russell F. Jagoditsh, head of the Quality Control Department of Chase Bag Co., Chicago, Ill., for the last two years, has been named Chief Chemist. **Jack W. Means,** active in the Chase Bag laboratory since 1952, has been promoted to Assistant Chief Chemist.

(Continued on page 74)



Baldwin's low-cost 60-H makes testing easy for the University of Pittsburgh

For testing parts of naval aircraft the University of Pittsburgh's Engineering Research Division uses the Baldwin 60-H. Also secondary load measuring devices such as dial type dynamometers and tension bars with SR-4 strain gages are calibrated by this testing machine.

Pitt chose the Model 60-H for testing economy and simplicity. And they've found this low-priced, easy to operate machine enables engineering students to do most of the test work. Its convenient control system, many automatic safety features and simple maintenance make testing at Pitt an easy and trouble-free operation.

The Baldwin Model 60-H gives the University of Pittsburgh *all* these testing benefits.

1. Simple operation makes it easy for engineering students to do test work.
2. The machine meets *all* requirements at low cost.
3. Accuracy of load measurements is well within laboratory requirements.
4. Separate frames for loading structure and indicator prevent transmission of shock when test specimens break.
5. Scale ranges of 0-12,000 lbs. and 0-60,000 lbs. are exactly suited to stress ranges of the test work.

Like the University of Pittsburgh, you can have *all* these benefits with the Baldwin Model 60-H. You'll learn that Baldwin designs testing machines to give outstanding performance. For more information about the Baldwin Model 60-H and other testing equipment, write now to Dept. 2503, Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.

TESTING BALDWIN BLH LIMA-HAMILTON *HEADQUARTERS*

BALDWIN - LIMA - HAMILTON

General Offices: Philadelphia 42, Pa. • Offices in Principal Cities

In Canada: Peacock Bros., Ltd., Montreal, Quebec

(*Continued from page 72*)

George Kalon, formerly Chief, Materials and Process Section, Detroit Arsenal, Center Line, Mich., has accepted the position as Materials and Process Engineer with Turbo Products, Inc., Pacoima, Calif.

George E. Keller, formerly Manager, Commercial Testing and Engineering Co., Charleston, W. Va., is now Manager, Coal Evaluation, U. S. Steel Corp., Pittsburgh, Pa.

Thomas B. Kennedy recently assumed the duties of Chief of the Concrete Division, Waterways Experiment Station, Corps of Engineers, Vicksburg, Miss. Mr. Kennedy has been with the Corps of Engineers since 1931.

Charles F. Kettering, Director and Research Consultant, General Motors Corp., was elected to the Board of Trustees of Southern California Air Pollution Foundation.

S. C. Killian, Chief Engineer, Delta-Star Electric Div., H. K. Porter Co., Inc., Chicago, Ill., has been appointed Assistant General Manager of the Division, as well as Chief Engineer.

Austus B. Kinzel has been appointed Director of Research at Union Carbide & Carbon Corp., New York City. He will be responsible for administration and coordination of research for all divisions of the company.

Otto O. Knopf, formerly with the Federated Metals Div., American Smelting and Refining Co., Philadelphia, Pa., is now Chemist with the Janney Cylinder Co., in the same city.

Peter E. Kyle has resigned as Professor of Metallurgical Engineering at Cornell University, to join the research and development firm of Lessells and Associates, Inc., Boston, Mass., as Vice-President. Its activities embrace the fields of mechanical engineering, electronics, and mathematical physics.

J. J. Lane, formerly with the North American Cement Corp., New York City, is now Assistant Sales Manager, Northern Steel Co., Inc., Boston, Mass.

Fritz V. Lenel, specialist in powder metallurgy, has been advanced from associate to full professorship by Rensselaer Polytechnic Institute, Troy, N. Y.

J. B. Macelwane, Dean, School of Industrial Technology, St. Louis University, is one of eight scientists recently named by President Eisenhower to be members of the National Science Board, National Science Foundation, for terms of six years.

William P. Martin, Chairman of the ASTM-AOAC Joint Committee on Soil Conditioners, formerly with Ohio State University, is now head of the Agronomy Department, University of Minnesota.

E. K. McMahon, former Supervisor in Chemical Engineering, Research Div., Tennessee Products & Chemical Corp., Chattanooga, is now Manager of Technical Sales Development for the company in Nashville.

Leonard I. Meisel, of Naval Air Material Center, Philadelphia, Pa., was presented with official notification of superior accomplishment step increase, for his initiating of a guide for the Aeronautical Materials Laboratory in preparing technical reports. He was cited in "recognition of performance of duty over and above the normal requirements" of his position.

Stephen Mikochik, formerly on the faculty of Manhattan College Civil Engineering Dept., is now Assistant Professor of Civil Engineering, Polytechnic Institute of Brooklyn.

Carl W. Muhlenbruch, formerly Professor of Civil Engineering, Northwestern Technological Institute, Evanston, Ill., is now President, Educational and Technical Consultants, Inc., in the same city.

Fred Nolls has been appointed head of the B. F. Goodrich Engineering Test Section at the Wheel & Brake Plant in Troy, Ohio.

Robert V. Osborne, Vice-President, Lakeside Malleable Castings Co., Racine, Wis., was elected President of the Wisconsin Chapter of the American Foundrymen's Society for 1954–1955.

Elbert A. Sanford, Director of Research for Pfaudler Co., Rochester, N. Y., has been elected a Vice-President of his company.

Robert A. Saxer, formerly Chief Metallurgist, The Colorado Fuel and Iron Corp., Wickwire Spencer Steel Div., Claymont (Del.) Plant, is now Senior Metallurgist, Hamilton-Standard Div., United Aircraft Corp., Windsor Locks, Conn.

Gale C. Smith, until recently associated with U. S. Industrial Chemical Co., Division of National Distillers Products Corp., Cleveland, Ohio, is now with Archer-Daniels-Midland Co., Cleveland, Ohio.

LeRoy Allan Thorssen, formerly Consulting Engineer, Materials Testing Laboratories, Edmonton, Canada, has been named President, Light Weight Aggregates of Canada, Calgary.

United States Steel Corp., Pittsburgh, Pa., recently announced new titles for the following: **J. B. Austin,** Assistant Vice-President, Fundamental Research; **Leon C. Bibber,** Chief Research Engineer—Welding; **W. Stewart Debenham,** Chief Research Engineer—Refractories; **John M. Hodge,** Chief Research Engineer—Alloys, Forgings and Railroad Materials; **W. T. Lankford,** Chief Research Engineer—Specialty Products; **R. B. Mears,** Director, Applied Research Laboratory; and **O. E. Romig,** Assistant Director, Administration Services—Applied Research Laboratory.

Ralph E. Van Deventer recently joined Alloy Engineering & Casting Co., Alloy Casting Div., Champaign, Ill., as Chief Metallurgist and Associate Project Director.

James S. Vanick, Metallurgist, Development and Research Div., International Nickel Co., New York City, has been elected Chairman of the New York section, American Institute of Mining and Metallurgical Engineers.

William B. Wallis, President, Lectromelt Furnace Corp., Pittsburgh, Pa., received the Pennsylvania State University's 1954 Distinguished Alumnus Award, in recognition of his work in developing and introducing the electric furnace in the production of special alloy steel. The citation named Mr. Wallis "a leader in one of the outstanding industrial advances of our time." Mr. Wallis was graduated from the University in the class of 1911.

E. T. Walton, formerly at the Midland (Pa.) Works of Crucible Steel Co., has been appointed to the central metallurgical offices in Pittsburgh as Metallurgical Engineer.

Richard D. Wells, Director of Research, Bates Manufacturing Co., Lewiston, Me., was elected Chairman of the General Research Advisory Committee of Textile Research Institute.

George Stafford Whitby, Professor Emeritus and Director of Rubber Research at the University of Akron, was awarded an honorary fellowship in the Chemical Institute of Canada. The honor was given in recognition of his significant contributions to Canadian chemistry and chemical engineering, and of his long participation and effective leadership in Canadian chemical organizations.

BUREAU OF STANDARDS NOTES

Allen V. Astin, Director of the National Bureau of Standards, recently announced new assignments within the Mineral Products Division and the Organic and Fibrous Materials Division:

Irl C. Schoonover has been named the Chief of the Mineral Products Division and has assumed his new duties in Room 2042 of the Industrial Building. Dr. Schoonover was the Assistant Division Chief of the Organic and Fibrous Division and Head of the Polymer Structure Section prior to this new appointment.

Norman Bekkadahl was named Head of the Polymer Structure Section. He has been Assistant Chief of the Rubber Section for many years and is an active member of ASTM Committee D-11 on Rubber.

William D. Appel, Chief of the Textiles Section for many years, and chairman of Committee D-13 on Textiles, was made Assistant Chief of Organic and Fibrous Materials Division. Mr. Appel is 1954 recipient of the Olney Medal of the American Association of Textile Chemists and Colorists.

(*Continued on page 76*)

(*Continued from page 74*)

Douglas E. Parsons, Chief of the Building Technology Division, and ASTM Director and member of the Standards Committee, has been made a new associate member of the Building Research Institute.

Clarence H. Hahner, Chief of the Glass Section of the Mineral Products Division, has been serving as acting Chief of the Mineral Products Division, and will continue to serve as assistant Division Chief as well as Chief of the Glass Section.

John A. Bennett, Chief of the Mechanical Metallurgy Section of the National Bureau of Standards, has received the Department of Commerce Silver Medal for Meritorious Service. The award was made for "very valuable contributions in the field of metallurgical science and technology, with particular reference to the mechanism of fatigue failures in metals, and for meritorious authorship."

Charles C. Hartman, in charge of the Varnish and Lacquer Unit, Organic Coatings Section, National Bureau of Standards, has received the Department of Commerce Silver Medal for Meritorious Service, in recognition of "outstanding contributions for over 33 years in the chemistry and technology of organic coatings."

Herbert Insley, retired Chief of the National Bureau of Standards' Mineral-Products Div., has received the Department of Commerce Gold Medal for Exceptional Service. The award was made for "outstanding achievement in the field of petrography and microscopy, particularly as applied to glass and to hydraulic cements, and for his extremely able leadership in the ceramic profession for many years." Dr. Insley retired from the Bureau in December, 1953.

Wilmer Souder, Consultant to the National Bureau of Standards, retired from Federal service. Associated with the Bureau for 39 years, he was organizer and first chief of the Bureau's Dental Research Laboratory and the Identification Research Laboratory. He is internationally known for his work in both crime detection and dental materials. Dr. Souder has been a Special Adviser-Member of ASTM Committee E-1 on Methods of Testing since 1948, serving as chairman of the Subcommittee on Methods for Density for several years.

Lauriston S. Taylor, Chief of the Atomic and Radiation Physics Div., National Bureau of Standards, has been presented the Henry Harrington Janeway Award for outstanding accomplishments in the field of applications of penetrating radiations in medical science. This award is given annually by the American Radium Society.

NEW MEMBERS . . .

The following 111 members were elected from June 8 to August 16, 1954, making the total membership 7682 . . . . . . Welcome to ASTM

Note—Names are arranged alphabetically—company members first, then individuals

CHICAGO DISTRICT

Barber-Colman Co., Fred A. Horton, Standards Engineer, P.O. Drawer 99, Rockford, Ill.

Chemicals Materials Corp., W. Rex Bell, Jr., Vice-President, Wabash at Brown Ave., Terre Haute, Ind.

National Petro-Chemicals Corp., Howard W. Woodham, Product Applications Development, Box 109, Tuscola, Ill.

Nobles Engineering and Manufacturing Co., Howard E. Harding, Chief Engineer, 645 E. Seventh St., St. Paul 6, Minn.

Northwestern Steel and Wire Co., E. W. Rainey, Metallurgist, Avenue B and Wallace St., Sterling, Ill.

Oster Manufacturing Co., John, Kenneth Ross, Metallurgist-Chemist, 1 Main St., Racine, Wis.

Plastics Engineering Co., Ernest F. Siegel, 1607 Geele Ave., Sheboygan, Wis.

Steel City Testing and Engineering Laboratories, Michael N. Pallotto, Director, 13055 Brainard Ave., Chicago 33, Ill.

Bowers, Ralph E., Chemist, Industrial Coatings Corp., 3227 S. Shields Ave., Chicago, Ill. For mail: 4205 W. Haddon Ave., Chicago 51, Ill.

Bull, A. S., Manager, Insulite Technical Service, Insulite Div., Minnesota and Ontario Paper Co., 500 Baker Arcade Bldg., Minneapolis 5, Minn.

Carlgren, Ragnar, Chief Chemist, W. F. Hall Printing Co., 4600 W. Diversey Ave., Chicago 39, Ill.

Duluth, City of, Engineering Dept., Room 211, City Hall, Duluth 2, Minn.

Fernandez, Arthur J., Quality Control Engineer, Land-Air, Inc., 440 W. Superior, Chicago 10, Ill. For mail: 734 S. Laramie Ave., Chicago 44, Ill.

Laughlin, E. E., Chief Chemist, Illinois Industrial Rubber Co., Ladd, Ill.

Miller, Kenneth J., Superintendent of Research, Houghton Vix-Sny Co., 130 Washington Ave., S., Hopkins, Minn.

Pallotto, Michael A., Steel City Testing and Engineering Laboratories, 13055 Brainard Ave., Chicago 33, Ill. For mail: 3303 Carondale Ave., Chicago 33, Ill. [J]*

CLEVELAND DISTRICT

Benko, Ernest J., Chemist, Brush Laboratories Co., 540 E. 105th St., Cleveland 8, Ohio. For mail: Box 2690, Cleveland 7, Ohio.

McConville, James K., Chief Metallurgist, Accurate Die Casting Co., 3089 E. Eightieth St., Cleveland 4, Ohio.

Shaw, Ronald E., Process Engineer, Rockwell Spring and Axle Co., Box A, Newton Falls, Ohio.

Steckler, Robert, Vice-President, Synthetic Organics, Inc., 8200 Harvard Ave., Cleveland 5, Ohio.

DETROIT DISTRICT

Radioactive Products, Inc., John R. Niles, Vice-President, 540 W. Congress, Detroit 26, Mich.

Blecki, Joseph A., Mechanical Engineer—Piping, The Detroit Edison Co., 2000 Second Ave., Detroit 26, Mich.

Ericson, Lambert T., Chief Engineer, The Jennison Wright Corp., 2463 Broadway, Toledo 9, Ohio.

Phillips, Carl L., Chief Chemist, Petoskey Portland Cement Co., Petoskey, Mich.

Sinnott, M. J., Associate Professor, Chemical and Metallurgical Engineering Dept., University of Michigan, Ann Arbor, Mich.

Timmons, George A., Vice-President, Climax Molybdenum Co. of Michigan, 14410 Woodrow Wilson, Detroit 38, Mich.

NEW ENGLAND DISTRICT

Gabriel Electronics Div., The Gabriel Co., M. J. Duggan, Quality Control Engineer, Endicott St., Norwood, Mass.

General Electric Co., Aircraft Gas Turbine Div., Small Aircraft Engine Dept., William L. Badger, Manager, Small Aircraft Engine Lab., 1000 Western Ave., W. Lynn, Mass.

Beacon Co., Arthur G. Blake, Chief Chemist, 33 Richdale Ave., Cambridge 40, Mass.

NEW YORK DISTRICT

Church, Francis G., Technical Supervisor, National Carbon Co., Division of Union Carbide and Carbon Corp., 30 E. 42nd St., New York 17, N. Y.

Corr, John E., Large Steam Turbine-Generator Dept., General Electric Co., 273 North Ave., Schenectady 5, N. Y.

Euverard, Maynard, Technical Assistant to Vice-President for Engineering, American Machine and Foundry Co., 261 Madison Ave., New York 16, N. Y. For mail: 300 Lupine Way, Short Hills, N. J.

Kaltenbach, Pierre, Grand Central Terminal Bldg., 25 Vanderbilt Ave., New York 17, N. Y.

Karol, Reuben H., Partner, Karol & Warner, 432 Cedar Ave., Highland Park, N. J.

LeCaron, Charles S., Vice-President, Templar Adhesives, Inc., 125 Fifty-first St., Brooklyn 32, N. Y.

Lowenstein, Philip, Technical Advisor, Ace Scientific Supply Co., Inc., Box 127, Linden, N. J. [J]

Lunchick, Myron E., Senior Structures Engineer, Republic Aviation Corp., Dept. 16, Farmingdale, L. I., N. Y.

Merrill, Arthur M., Editor, *Plastics Technology*, 386 Fourth Ave., New York 16, N. Y.

Metz, Edward, Engineering Laboratory Supervisor, Leviton Manufacturing Co., 236 Greenpoint Ave., Brooklyn 22, N. Y.

Rome Air Development Center, Harold Nares, Chief, Components and Materials Test Section, U. S. Dept. of the Air Force, Test and Evaluation Lab., Griffiss Air Force Base, Rome, N. Y.

Sawyer, James L., Research Chemist, Lone Star Cement Corp., Hudson, N. Y.

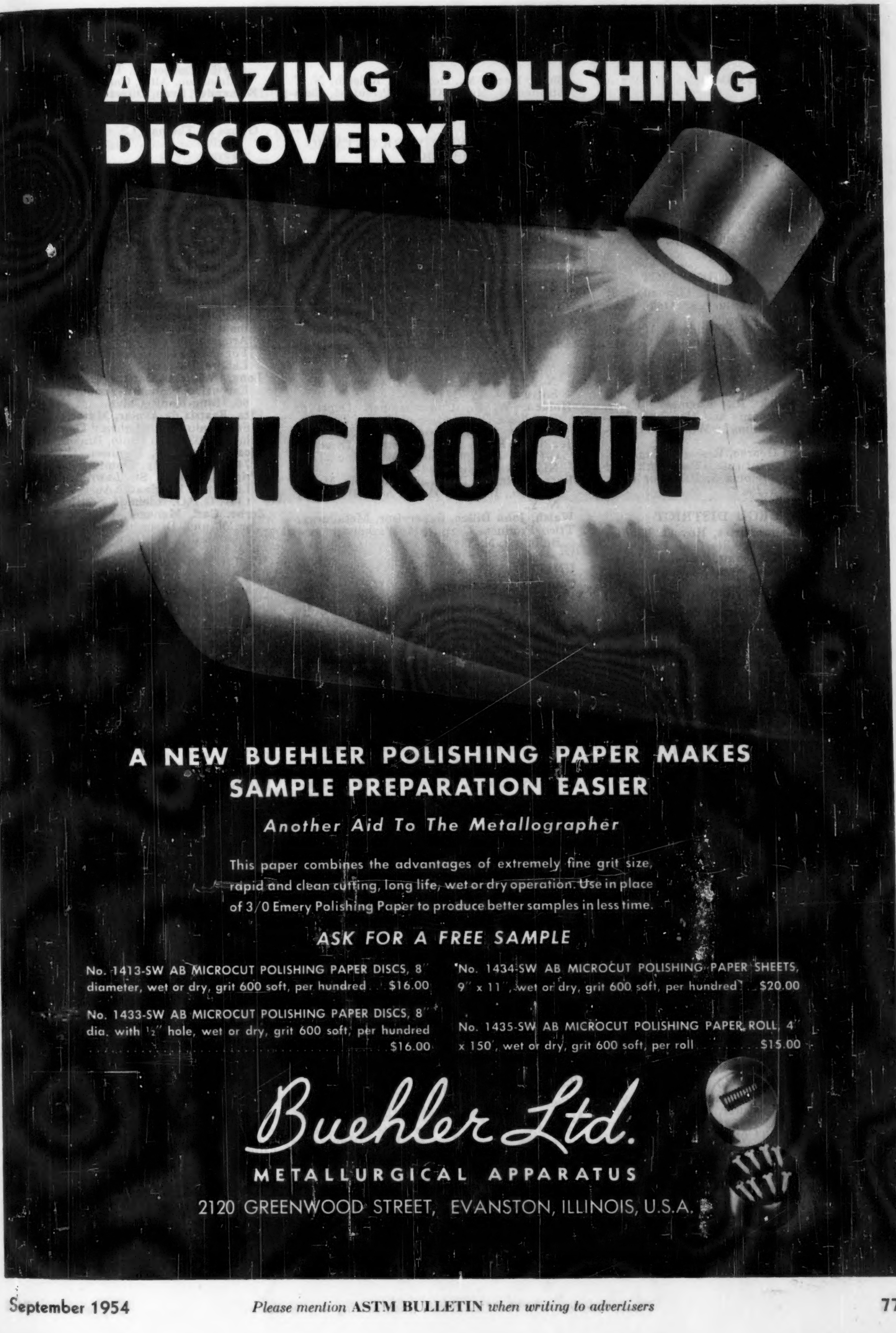
Stofka, Edward J., Student, Metallurgy, Rensselaer Polytechnic Inst., Troy, N. Y. For mail: 1932 Fifth Ave., Troy, N. Y. [J]

Trovato, Victor, Section Manager, Quality Control Lab., Chemical and Metallurgical Processes, Ford Instrument Co., Division of Sperry Corp., 31-10 Thomson Ave., Long Island City 1, N. Y.

Vance, Roy M., Director of Rubber Research, Columbian Carbon Co., Research Labs., 214 Forty-fourth St., Brooklyn 32, N. Y.

Voyda, Theodore, Technical Director, Apothe-

(*Continued on page 78*)


AMAZING POLISHING DISCOVERY!
MICROCUT
A NEW BUEHLER POLISHING PAPER MAKES SAMPLE PREPARATION EASIER
Another Aid To The Metallographer
This paper combines the advantages of extremely fine grit size, rapid and clean cutting, long life, wet or dry operation. Use in place of 3/0 Emery Polishing Paper to produce better samples in less time.
ASK FOR A FREE SAMPLE
No. 1413-SW AB MICROCUT POLISHING PAPER DISCS, 8" diameter, wet or dry, grit 600 soft, per hundred . . $16.00
No. 1433-SW AB MICROCUT POLISHING PAPER DISCS, 8" dia. with ½" hole, wet or dry, grit 600 soft, per hundred . . . $16.00
No. 1434-SW AB MICROCUT POLISHING PAPER SHEETS, 9" x 11", wet or dry, grit 600 soft, per hundred . . $20.00
No. 1435-SW AB MICROCUT POLISHING PAPER ROLL, 4" x 150', wet or dry, grit 600 soft, per roll . . . $15.00
Buehler Ltd.
METALLURGICAL APPARATUS
2120 GREENWOOD STREET, EVANSTON, ILLINOIS, U.S.A.

(*Continued from page 76*)

caries Hall Co., 28 Benedict St., Waterbury 88, Conn.

NORTHERN CALIFORNIA DISTRICT

Kelly, J. W., Professor of Civil Engineering, Engineering Materials Lab., University of California, Berkeley 4, Calif.
Searls, Niles I., Vice-President, Noble Co., 1860 Seventh St., Oakland 20, N. Y.

OHIO VALLEY DISTRICT

Limbach, Wilton G., Chief Chemist, Southwestern Portland Cement Co., E. Xenia Dr., Fairborn, Ohio.

PHILADELPHIA DISTRICT

Ivins Steel Tube Works, Inc., Ellwood, H. R. Irwin, Chief Metallurgist, Oak Lane, Philadelphia 26, Pa.
Branning, D. J., Vice-President, Hygrade Atlas, Inc., Simpson, Lackawanna County, Pa.
Fleming, Emory G., Chief Chemist, McCloskey Varnish Co., 7600 State Rd., Philadelphia 36, Pa.
Klauck, Frederick R., Engineer, E. I. du Pont de Nemours and Co., Inc., Wilmington, Del. For mail: Whitewood, Landenberg, Pa.
Sohmer, Robert George, Research Engineer, The Franklin Institute, Twentieth and Parkway, Philadelphia 3, Pa. For mail: Box 77, Berwyn, Pa.

PITTSBURGH DISTRICT

Susquehanna Laboratories, Roy C. Kindig, Jr., Owner, Box 303, Clearfield, Pa.
Mohr, William C., Ceramic Engineer, Shenango Pottery Co., New Castle, Pa.

ST. LOUIS DISTRICT

Halsted, Leroy E., Assistant Research Engineer, Ash Grove Lime and Portland Cement Co., Chanute, Kans.
Phillips, Howell L., Assistant Refinery Superintendent, El Dorado Refining Co., Box 551, El Dorado, Kans.
Schnell, Donald F., 1236 Sells Ave., St. Louis 15, Mo. [J]
Spradling, Stuart L., Research Chemist, MFA Oil Co., Columbia, Mo.

SOUTHERN CALIFORNIA DISTRICT

Whiteneck, L. L., Senior Harbor Engineer, Long Beach Harbor Dept., 1333 E. Embarcadero St., Long Beach 2, Calif.

SOUTHWEST DISTRICT

Southwest Research Inst., Charles F. Balleisen, Editor, *Technical Calendar*, 8500 Culebra Rd., Box 2296, San Antonio 6, Tex.
Texas Eastman Co., W. E. Sweeney, Supervisor, Quality Control, Box 2068, Longview, Tex.
Chairez, Frank, Chief Chemist, Eastern States Petroleum Co., Inc., Box 5008, Harrisburg Station, Houston 12, Tex.
Kroeger, Otto P., Chief Chemist, Southwestern Portland Cement Co., Box 392, El Paso, Tex.
Maese, Robert H., Owner, Robert H. Maese, Analytical Chemists and Engineers, 2513 Wyoming St., El Paso, Tex.
Quay, Albert H., Special Representative, Tuboscope Co., Houston, Tex. For mail: Box 8295, Houston 4, Tex.

WASHINGTON (D. C.) DISTRICT

Gray Concrete Pipe Co., Inc., F. B. Gray, President and Treasurer, 209 Randolph St., Thomasville, N. C.
Armstrong, James B., Chief Chemist, Bethlehem Steel Co., Sparrows Point, Baltimore 19, Md.
Burdick, Milton D., Ceramic Engineer, National Bureau of Standards, Washington 25, D. C.
Enrick, Norbert Lloyd, Research Associate, Institute of Textile Technology, Charlottesville, Va.
Otterson, George L., Engineer, Materials Office, Chief of Engineers, U. S. Dept. of the Army, Bldg. T-7, Washington 25, D. C. For mail: 1306 Tracy Pl., Falls Church, Va.
Shaw, Henry M., Box 1996, Raleigh, N. C.
Strohecker, Henry O., Jr., President, Carolina Concrete Pipe Co., Box 814, Charlotte 1, N. C.

WESTERN NEW YORK-ONTARIO DISTRICT

Underwriters' Laboratories of Canada, E. F. Tabisz, General Manager, 340 Richmond St., W., Toronto 2B, Ont., Canada.
Bohn, G. H., Design and Metallurgical Engineer, Linde Air Products Co., East Park Dr. and Woodward Ave., Tonawanda, N. Y.
Bratton, Edward W., Assistant Manager, Abrasive Engineering Branch, Coated Products Div., The Carborundum Co., Niagara Falls, N. Y.
Clarke, Sidney G., Chief Engineer, Hamilton Gear and Machine Co., Ltd., 950 Dupont St., Toronto 4, Ont., Canada.
Divers, C. Kenneth, Quality Control Engineer, Brown-Lipe-Chapin Div., General Motors Corp., Town Line Rd., Syracuse, N. Y. For mail: 209 Charles Ave., Solvay, N. Y. [J]
Holden, W. F., Commissioner, Dept. of Buildings, Corporation of City of Toronto, 465 Bay St., Toronto 6, Ont., Canada.
Jenkins, Ford M., Research Director, O-Cel-O Div. of General Mills, Inc., 1200 Niagara St., Buffalo 13, N. Y.
Rycroft, Ralph, President, Kencroft Malleable Co., Inc., 373 Hertel Ave., Buffalo 7, N. Y.
Walsh, John Dillon, Supervisor, Metallurgy, Trico Products Corp., 817 Washington St., Buffalo 3, N. Y.

UNITED STATES AND POSSESSIONS

Courtaulds (Alabama), Inc., G. V. Lund, Manager, Technical Service and Development, Box 1076, Mobile, Ala.
Kennedy, Thomas B., Chief, Concrete Div., U. S. Waterways Experiment Station, P.O. Drawer 2131, Jackson, Miss.
Largent, Richard, Executive Vice-President, Hunt Process Corp.—Southern, Ridgeland, Miss.
Mather, Katharine, Chief, Petrography Section, Concrete, U. S. Waterways Experiment Station, P.O. Drawer 2131, Jackson, Miss.
Maxwell, Clyde V., Jr., Structural Engineer, First Federal Saving and Loan Bldg., Jackson, Miss.
McColley, Earl S., Coordinator of Laboratory Standards, Textile Div., Celanese Corp. of America, Box 1001, Rock Hill, S. C.
McCutchan, R. L., Vice-President and General Manager, Gross Inspection Agency, Inc., 1703 E. Queen Ann Dr., Seattle 9, Wash.
Millman, N., Technical Director, Clay Div., J. M. Huber Corp., Huber, Ga.
Nashville, City of, Dept. of Public Works, W. A. Coolidge, Director of Public Works, 300 City Hall, Nashville 3, Tenn.
Woodson, Dillard D., District Engineer, The Asphalt Inst., 801 Second Ave., New York, N. Y. For mail: 1024 Mortgage Guarantee Bldg., Atlanta 3, Ga.

OTHER THAN U. S. POSSESSIONS

Conductores Electricos, S.A.C.V., L. L. Carter, General Manager, Poniente 140 Esq., Norte 59, Industrial Vallejo, Mexico D. F. 16, Mexico.
Ontario Steel Products Co., Ltd., Paul B. Croly, Director of Plating, Chatham, Ont., Canada.
Apert, Charles, Engineer, French Air Ministry, Centre d'Essais des Moteurs et Hélices, Saclay par Jouy-en Josas (Seine & Oise), France.
Brasseur, Alexis R. G., Civil Engineer, 75, avenue de Lavaux, Pully, Switzerland. [J]
Burkhard, G., Mill Research Director, Quebec North Shore Paper Co., Baie Comeau, P. Q., Canada.
Davies-Graham, Lewis Richard, Works Manager, Swan Portland Cement, Ltd., Rivervale, Western Australia.
Ford, George, Associate Professor, Dept. of Civil Engineering, University of Alberta, Edmonton, Alta., Canada.
Fornander, Sven, Director of Research, Jernkontoret, Jungstradgårdsgätan 6, Stockholm C, Sweden.
Garcia B., Thomas, Chief Chemist, Petroleos Mexicanos, Lab. Tugn, Poza Rica, Ver., Mexico.
Garrido, Martin, Textile Engineer, Comercial Pirelli, S. A., Ronda Universidad 18, Barcelona, Spain.
Haagberg, Fredrik, Chief Chemist, Svenska Esso AB, Stockholm 7, Sweden.
Hersey, E. Peter, President, The Hersey Laboratories, Ltd., 128 Elmslie St., Montreal 32, P. Q., Canada.
Hurgeton, John Craig, Technical Superintendent, Canadian Chemical Co., Ltd., Box 99, Edmonton, Alta., Canada.
Latif, Mohammad Abdul, Production Engineer, Inspection and Technical Development Directorate, Chief Inspectorate of Armaments, Box 14, Rawalpindi, Pakistan. For mail: 158A, Scott Rd., Moghalpura, Lahore, Pakistan.
Long, William Garland, Industrial Sales Executive, Standard-Vacuum Oil Co., Box 86, Hong Kong, China.
Piza, Beatriz de Aguiar, Materials Engineer, Sao Paulo State Highway Dept., Rua Pinheiros 1037, Sao Paulo, Brazil.
Ricart, Fernando, Engineer, C. N. Penson 74, Trujillo City, Dominican Republic.
Wright, Norman St. Lawrence, Technical Librarian, Kelvinator Australia, Ltd., Box 1347, G.P.O. Adelaide, South Australia.
Zerbe, Carl, Manager, Fachausschuss Mineralöl und Brennstoffnormung, Glockengiesserwall 2 II, Hamburg 1, Germany.

* J denotes Junior members.

DEATHS...

E. P. Bolin, Technical Supervisor, Frit Production, Chicago Vitreous Corp., Chicago, Ill. (June 23, 1954). Representative of company membership since 1949, also representative of his company on Committee C-22 on Porcelain Enamel and its Subcommittees I on Research, and III on Test Methods and Specifications. He had been serving for some time as Secretary of the Sections on Raw Material and Material in Process of Subcommittee III.

Arthur H. Bunte, Materials Engineer, Colorado State Highway Department, Denver (June 3, 1954). Representative of Highway Department membership since 1946, serving on Committee D-4 on Road and Paving Materials.

Leon H. Johnson, Chief Engineer, Struthers Wells Corp., Warren, Pa. (June 8, 1954). Member since 1941. Member of Committee A-10 on Iron-Chromium, Iron-Chromium-Nickel, and Related Alloys since 1940; and of the Joint AWS-ASTM Committee on Filler Metal since 1942, serving on its subcommittees on Iron and Steel Filler Metal and High Alloy Steel Filler Metal.

H. S. Krauter, Chief Engineer, American Chain & Cable Co., Inc., Reading, Pa. (June 9, 1954). Representative of company since 1946 on Committee A-1 on Steel, serving for some time on its Subcommittees VIII on Steel Castings, and XXII on Valves, Fittings, Pipings and Flanges for High-Temperature and Subatmospheric Temperatures.

(*Continued on page 80*)

(*Continued from page 78*)

W. R. McCaffrey, Secretary, Canadian Standards Assn., Ottawa. Representative of Association membership since 1938. Mr. McCaffrey devoted many years of his life toward the building up of the CSA. In his work he was very cognizant of the importance and value of a close tie-in with both the ASTM and the American Standards Association. He had a wide circle of acquaintances in Canada and many friends also in the States.

A. C. Mengel, American Locomotive Co., Schenectady, N. Y. Representative of company on Committee D-2 on Petroleum Products and Lubricants since 1950, serving on Technical Committee F on Diesel Fuels and on Research Division III on Elemental Analysis and its Section on Determination of Trace Elements, and Subsection on Spectrographic Analysis of Lubricating Oils.

D. J. Peake, Florence Pipe Foundry and Machine Co., Florence, N. J. (June 16, 1954). Member of ASA Sectional Committee A 21 on Specifications for Cast-Iron Pipe and Fittings since 1935.

Alfred J. Porter, a Vice-President and Director of Heppenstall Co., Pittsburgh steel forgings manufacturer, and manager of the company's plant at Bridgeport, Conn., died suddenly at his home in Bridgeport on August 11, 1954. He was 58 years old. Mr. Porter served as President and Director of Heppenstall Co., Bridgeport, a subsidiary, since 1942. He was elected a Vice-President of the parent company in February, 1954. Member of ASTM since 1933.

Harry A. Schwartz (retired), Director of Research, National Malleable and Steel Castings Co., Cleveland, Ohio (July 25, 1954). Affiliated with ASTM since 1907, Dr. Schwartz was a very active worker in the Society. He was the first Chairman of the Cleveland District, serving in this office for seven years. He made valued contributions to ASTM technical work, participating for many years in the activities of Committees A-7 on Malleable-Iron Castings, and E-4 on Metallography—as representative of the American Foundrymen's Society. He was Chairman of Committee A-7 for 11 years (through 1947), and headed several of the subcommittees. Dr. Schwartz had been connected with the National Malleable and Steel Castings Co. for more than a half century. In 1953 he retired from active duties as manager of the research department which he had established in 1920, continuing to serve, however, in an advisory capacity as assistant to the vice-president in charge of production. A member of numerous professional groups, he had received awards in this country and in Europe for outstanding contributions to the foundry industry.

Erwin Sohn, Consultant, Eagle-Picher Co., Research Dept., Joplin, Mo. (May 5, 1954). Member since 1934; also member for several years of Committee B-8 on Electrodeposited Metallic Coatings and Committee C-22 on Porcelain Enamel.

Herman Weisberg, Mechanical Engineer, Electric Engineering Department, Public Service Electric and Gas Co., Newark, N. J., died June 29, 1954, in Johns Hopkins Hospital, Baltimore, Md., after a long illness. He was 54. Associated with Public Service Electric and Gas Co. for many years, he had been Mechanical Engineer since 1941. Affiliated with a number of technical and scientific organizations, he had been elected a Fellow of The American Society of Mechanical Engineers this past year, being cited for "outstanding contributions to the power-generating field." He had had responsible charge of the over-all mechanical engineering features involved in the engineering, design, and construction of some of the largest and most efficient thermal electric power-plant installations in the country. One of the first engineers to advocate and use welded piping and valves in power-plant service, he also pioneered in the use of higher steam pressures and temperatures in steam power-plant design. In ASTM, Mr. Weisberg had been active in Committee A-1 on Steel, and its Subcommittee XXII; also had served on the ASTM-ASME Joint Committee on Effect of Temperature on the Properties of Metals, and its Steam Power Panel.

Lansing Sadler Wells, of the National Bureau of Standards, Washington, D. C., consultant chemist and an authority on the chemistry of lime, died August 8, 1954. A member of the Bureau staff since 1924, Dr. Wells was chief of its lime and gypsum section for many years. A member of numerous technical groups, he had written papers on cement, lime, and gypsum; and in 1946 had patented a method for extracting aluminum from clay. He had been affiliated with ASTM since 1930, serving through the years on several technical committees and ASA sectional committees. His important ASTM contributions were concentrated mainly in Committee C-2 on Magnesium Oxychloride and Magnesium Oxysulfate Cements, and Committee C-11 on Gypsum. He was chairman of the former group 1947–1953, and of the latter committee 1937–1953.

Herbert Lucius Whittemore, Retired Chief, Engineering Mechanics Section, National Bureau of Standards, Washington, D. C. (July 11, 1954). Affiliated with the Society since 1911, Mr. Whittemore had been honored at the recent annual meeting by an ASTM Award of Merit, in recognition of "outstanding contributions to the progress of the Society toward its objectives by the development of apparatus and methods of testing." He had rendered valued aid in the deliberations of Committee E-1 on Methods of Testing, specifically its subgroups concerned with bend testing and calibration of testing machines; also in the work of Committee E-6 on Methods of Testing Building Constructions. (Note p. 20, July, 1954 BULLETIN.) An authority on testing engineering materials, Mr. Whittemore invented the Whittemore fulcrum plate strain gage. When he retired he was working on testing components for prefabricated houses. Other awards he had received included the James Turner Morehead Medal for basic research in oxyacetylene welding and success in promoting the use of safe fusion welding, Longstreth medal from Franklin Institute, and certificate of award from the Washington section of The American Society of Mechanical Engineers.

Calendar of Other Societies' Events

STANDARDS ENGINEERS SOCIETY—October 1 and 2, Annual Meeting, Haddon Hall, Atlantic City, N. J.

THE ELECTROCHEMICAL SOCIETY, INC.—October 3–7, Statler Hotel, Boston, Mass.

SOCIETY OF AUTOMOTIVE ENGINEERS—October 4–9, National Aeronautic Meeting, Statler Hotel, Los Angeles, Calif.

AMERICAN INSTITUTE OF MINING AND METALLURGICAL ENGINEERS—October 5–9, Industrial Minerals Div., Fall Meeting, Whiteface Inn, Lake Placid, N. Y.

NATIONAL FOUNDRY ASSOCIATION—October 6–8, 56th Annual Meeting, La Salle Hotel, Chicago, Ill.

AMERICAN OIL CHEMISTS SOCIETY—October 11–13, Annual Fall Meeting, Radisson Hotel, Minneapolis, Minn.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS—October 11–15, Fall General Meeting, Morrison Hotel, Chicago, Ill.

NATIONAL ASSOCIATION OF CORROSION ENGINEERS—October 12–15, Annual South Central Reg. Conf., Adolphus Hotel, Dallas, Tex.

AMERICAN CHEMICAL SOCIETY—October 12–15, 8th National Chemical Exposition, Chicago Coliseum, Chicago, Ill.

FOUNDRY EQUIPMENT MANUFACTURER'S ASSOCIATION—October 14–16, Annual Meeting, The Greenbrier, White Sulphur Springs, W. Va.

OPTICAL SOCIETY OF AMERICA—October 14–16, Annual Meeting, Hotel Ambassador, Los Angeles, Calif.

AMERICAN INSTITUTE OF MINING & METALLURGICAL ENGINEERS—October 17–20, Petroleum Div., Fall Meeting, Plaza Hotel, San Antonio, Tex.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS—AMERICAN SOCIETY OF LUBRICATION ENGINEERS—October 18–19, Joint Conference on Lubrication, Lord Baltimore Hotel, Baltimore, Md.

ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA—October 18–20, 15th Annual Water Conference, Hotel William Penn, Pittsburgh, Pa.

AMERICAN SOCIETY OF CIVIL ENGINEERS—October 18–22, Annual Meeting, Hotel Statler, New York, N. Y.

ENGINEERING FOUNDATION—October 21, New York, N. Y.

AMERICAN CHEMICAL SOCIETY—October 21–23, Regional Meeting, Thomas Jefferson Hotel, Birmingham, Ala.

NEWS NOTES ON

Laboratory Supplies and Testing Equipment

Please mention ASTM BULLETIN when writing to suppliers

CATALOGS AND LITERATURE

High-Vacuum Coating Evaporator Features Built-In Photometer—A built-in optical photometer is used to measure coating thickness in a new vacuum coater announced by American Instrument Co., Inc. The photometer consists of a collimated light source and a sensitive photomultiplier detector. The detector can be placed to receive light reflected from the work or transmitted through the work. Complete details are given in *Bulletin 2252*.

American Instrument Co., Inc., Silver Spring, Md.

SR-4 Calibration Kit—Available from the Baldwin-Lima-Hamilton Corp. is the SR-4 Calibration Kit, a precise, highly versatile, portable instrument for calibration service involving either tension or compression loads. Accuracy up to ±1/10 per cent is listed as one notable feature. *Bulletin 4303* states that the equipment complies with ASTM requirements (ASTM Methods E 74) for such equipment.

Baldwin-Lima-Hamilton Corp., Testing Equipment Dept., Philadelphia 42, Pa.

Limit Controller—With the announcement of the new "700" Series LIMITROL Wheelco Instruments Div. makes available to industry a companion electronic limit controller for the versatile "400" Series Capacitrol. This LIMITROL provides economical insurance against human or instrument failures which may permit overshooting of critical temperatures. *Bulletin F-6313* describes the new "700" Series, LIMITROL.

Barber-Colman Co., Wheelco Instruments Div., Rockford, Ill.,

Spectrophotometer—A new ultraviolet near-infrared spectrophotometer designed specifically for the near-infrared region of the spectrum—filling an important gap in spectrochemical analysis has been announced. Its lead sulfide detector and quartz monochromator permit high-speed transmittance recording at cost and performance unmatched by conventional infrared instruments. Using a photomultiplier detector for ultraviolet work, the new instrument offers a guaranteed wavelength range of 220 to 2700 mu. For complete data, write for *Bulletin 352-220*.

Beckman Div., Beckman Instruments, Inc., Fullerton 1, Calif.

High Temperature Electric Tube Furnaces—New model high temperature electric tube furnaces, available for one, two, and four tubes, have been announced by Burrell Corp. Recommended use is for high temperature combustion in the determinations of carbons or sulfurs in ferrous and non-ferrous metals. *Bulletin*

(*Continued on page 82*)

(*Continued from page 81*)

No. 310 describes these complete self-contained units.

Burrell Corp., 2223 Fifth Ave., Pittsburgh 19, Pa.

Portland Cement—A new brochure explaining the characteristics of the five basic types of portland cement, as well as a number of specialty cements, has been issued by Calaveras Cement Co. Entitled, "There's a Calaveras Cement for Every Use," the publication contains a consolidated summary of Federal Government and ASTM specifications for all types of portland cement. Free copies on request.

Calaveras Cement Co., 315 Montgomery St., San Francisco 4, Calif.

Scientific Instruments and Laboratory Supplies—A new issue of *Cenco News Chats, No. 79,* has been announced by Central Scientific Co. Articles featured in this 28-page brochure include: one listing background data of the American Institute of Mining & Metallurgical Engineers, forced circulation and low temperature incubators, the role of design in instrumentation, Beta Ray H/C Meters, Beckman DR recording spectrophotometers, and photographs and descriptions of laboratory items.

Central Scientific Co., 1700 Irving Park Rd., Chicago 13, Ill.

Electric Centrifuges—Chicago Surgical & Electrical Co., Div. of Labline, Inc., has announced a new line of 1954 Electrifuges. New features include: modern streamline cabinet with Formica top; flush type safety catch; ball-bearing rubber-covered casters; storage space for accessories; built-in 6000 rpm speed indicator; 3-hr electric timer; electric brake, eliminating old style hand or foot brake; $\frac{1}{8}$-hp series wound motor; ball-bearing grease-sealed motor bearings never requiring lubrication; safety switch on cover, and Powerstat stepless speed control. Write for *Catalog No. 10.*

Chicago Surgical and Electrical Co., Div. of Labline, Inc., 217 N. Des Plaines St. Chicago 6, Ill.

Manual of Modern Instruments—Coleman Instruments has announced a new 64-page catalog. Included are complete discussions of theory and practice of Absorption Spectrochemistry, Nephelometry, Colorimetry, pH Measurement, Fluorimetry, and Flame Photometry. Copies should be requested on company letterhead.

Coleman Instruments, Inc. 318 Madison St., Maywood, Ill.

Process Monitor Mass Spectrometer—A precision electronic instrument designed to measure continuously the amount of the various constituents in a process stream is available from Consolidated Engineering Corp. Model 21-610 is produced especially for the chemical, petroleum, and gas industries.

Instruments and Instrumentation—A new issue of *CEC Recordings,* Vol. 8, No. 2 features ten articles on modern instruments and instrumentation, including cycloidal mass spectrometer, unique titrilog application for American Chicle, CVC process used by Eastman Kodak, wind tunnel measuring system, and Electro Data Coding class.

Consolidated Engineering Corp., 300 N. Sierra Madre Villa, Pasadena 15, Calif.

Single Position Electro-Analysis Apparatus—This apparatus provides multi-position operating efficiency at low cost. Analyses involving stationary electrodes or a rotating anode can be performed. Four elements comprise the analyzer: an electrode holder and cell support, heavy duty support, dc power supply delivering 1–5 amp and 3-speed stirrer, the latter two operating on 115 v, 60 cycle ac. Complete information in *Bulletin No. 370.*

Eberbach Corp., Ann Arbor, Mich.

Ultra Applicator—A new precision instrument for laying down wet films of any desired thickness has been developed by Gardner Laboratory, Inc. This new instrument is described as being particularly useful in laying down test films of plastic coatings or similar materials such as paints, varnishes, lacquers, adhesives, or the like, for various types of comparative tests and analyses such as those relating to color, opacity, durability, impact resistance, hardness, adhesion, and others. *Bulletin No. 155* describes the ultra applicator in detail.

Gardner Laboratory, Inc., Bethesda 14, Md.

(*Continued on page 84*)

(*Continued from page 82*)

Automatic Line-Voltage Regulator—A recent issue of the *Experimenter*, Vol. XXIX, No. 2, describes a high-speed, automatic line-voltage regulator available from the General Radio Co. The Type 1570-A Regulator has a 6-kva capacity, with ±0.25 per cent accuracy, an efficiency of 98 per cent, excellent transient response, and no power factor restrictions or wave-form distortion.

General Radio Co., 275 Massachusetts Ave., Cambridge 39, Mass.

Automatic Projection of Indentations New Feature of Reflex Machines for Hardness Testing—Reflex machines for Vickers, Knoop, Grodzinski, Brinell, and (optional) Rockwell tests, introduced by Gries Industries, Inc., feature unusual Test Load Capacities (from 1 to 250 kg), Push-Button Load Selection, and Automatic Projection. Test values based upon area of indentation are much larger than corresponding values based upon depth, and larger values can be measured more precisely. Measurement of depth values includes elastic deformations of machine and test piece. Hardness tests based upon area of indentation are independent of elastic deformations. Full information is contained in *Bulletin No. DIA-2*.

Gries Industries, Inc., Testing Machines Div., New Rochelle, N. Y.

New Reichert Research Metallograph Model MeF—A new six-page illustrated folder available from William J. Hacker & Co., Inc. describes the Reichert Metallograph which incorporates equipment for application of the most advanced methods of microscopic investigations.

William J. Hacker & Co., Inc., 82 Beaver St., New York 5, N. Y.

Precision Servo Computer Potentiometers—A 12-page technical paper, No. 341, entitled "Characteristics of Precision Servo Computer Potentiometers," discusses linearity and sets forth data on research, development, and trends in precision potentiometers. Available on request.

Helipot Corp., 916 Meridian Ave., South Pasadena, Calif.

Stress-Rupture Apparatus—Labquip Corp. has published a new four-page bulletin which describes creep and stress-rupture testing apparatus for the testing of special-alloy steels used in high-temperature service. Copies of this bulletin from the company.

Labquip Corp., 3521 N. Cicero Ave., Chicago 41, Ill.

Magnatest Electronic Non-Destructive Testing Instruments—The Magnatest Type FM-100 Series Conductivity Meter measures conductivity by simple hand detector pick-up. It evaluates material-alloy-hardness; sorts mixed nonmagnetic metals. The instrument determines degree of age hardening of aluminum and magnesium alloys. The unit gives immediate reading of conductivity in absolute units with no variables due to contact.

Magnaflux Corp., 7300 W. Lawrence Ave., Chicago 31, Ill.

New Magnetic-Particle Tester—An illustrated bulletin that explains the operation of a new magnetic-particle test unit called Portaflux is available gratis from the Research & Control Instruments Div., North American Philips Co. Objects under study are magnetized either by passing a current through the metal or through a surrounding cable in the form of a coil.

North American Philips Co., Inc. Mount Vernon, N. Y.

Radiation Measuring Equipment—The Nuclear Instrument and Chemical Corp. has recently printed a new 40-page, 2 color catalog describing its complete line of radiation measuring equipment including scalers, count rate meters, Geiger, proportional and scintillation counters, and complete radioisotope laboratories. Copies will be sent on request.

Nuclear Instrument & Chemical Corp., 223–233 W. Erie St., Chicago 10, Ill.

Thermometer Reading Lens—An adjustable magnifier for making accurate thermometer and buret readings is described in Specification No. 3000. Copies mailed on request.

Pellet Press—A convenient, hand-operated laboratory press for compressing granular or powdered materials into pellet form is described in Specification No. 2811. Interchangeable stainless steel punch and die sets are offered for making ¼, ⅜, and ½-in. diameter pellets up to ½ in. thick. Copies of this publication mailed on request.

Parr Instrument Co., 211 Fifty-third St., Moline, Ill.

(*Continued on page 85*)

(*Continued from page 84*)

Portable Hardness Testers—Portable hardness testers for laboratory and production testing are now available in two sizes, according to Riehle Testing Machines, Div. of American Machine and Metals, Inc. Model PHT-1 tests specimens up to $4\frac{1}{2}$ in. in diameter, while Model PHT-2 accommodates specimens up to 12 in. Employing standard Rockwell indentor and loadings, these portable hardness testers are reported to eliminate errors due to conversion from other scales. Both models offer Rockwell scales A, B, C, D, F, and G. *Bulletin RH-12-54* available on request.

Riehle Testing Machines, Div. of American Machine and Metals, Inc., East Moline, Ill.

Recording Equipment—A recent issue of *Right Angle*, Vol. 1, No. 4, published by the Industrial Div. of Sanborn Co., includes an article on bridge circuits and photographs and descriptions of Sanborn 150 recording equipment.

Sanborn Co., Industrial Div., Cambridge 39, Mass.

Laboratory Equipment—The 21st edition of "What's New for the Laboratory" has just been announced by the Scientific Glass Apparatus Co., Inc. Items featured in this 16-page brochure include the Ainsworth "Right-A-Weigh" and the Ohaus "Cent-O-Gram" Triple Beam; a glassware washing machine designed especially for laboratory use; six new Power stats; pH meter; polyethylene ware; pneumatic acid pump; low temperature cabinet, plus others. For your free copy write directly to the company.

Scientific Glass Apparatus Co., Inc., Bloomfield, N. J.

INSTRUMENT COMPANY NEWS

Burrell Corp., Pittsburgh, Pa.—The company has announced the promotion of George M. Edinger, former sales representative, to sales manager. With headquarters in Pittsburgh, Mr. Edinger will conduct an expanded sales program for the firm's scientific apparatus and laboratory chemicals.

Central Scientific Co., Chicago, Ill.—Gordon Baker has been appointed manager of the Los Angeles branch of the company, succeeding Richard N. Goldback who recently was made director of sales, it was announced by John T. Gossett, president. Mr. Baker, formerly manager of the Montreal branch of Central Scientific Co. of Canada, Ltd., joined the company in 1946 as a member of the sales staff.

Consolidated Engineering Corp., Pasadena, Calif.—Joseph E. Jenkins has been named manager of the Washington District office of CEC Instruments, Inc. sales and service subsidiary of Consolidated Engineering Corp., according to a recent announcement by Joseph F. Davidson, director of sales. Joining CEC Instruments, Inc., as a field engineer in August, 1953, Jenkins became field engineer in charge of Washington district operations in March, 1954.

(*Continued on page 86*)

(*Continued from page 85*)

Federal Telephone and Radio Co., Clifton, N. J.—Organization of an Instrument Division for the manufacture and distribution of measuring and testing instruments has been announced by Raymond S. Perry, president. The company will supply communication test equipment, standard capacitors, insulation test equipment, and electronic precision measuring instruments for laboratory and industrial use.

General Radio Co., Cambridge, Mass.—The company has announced the opening of a branch engineering and sales office at 8055 Thirteenth St., Silver Spring, Md. W. R. Saylor, formerly of the Sales Engineering Staff at Cambridge, is manager of the new office.

Emil Greiner Co., New York, N. Y.—The company recently announced election of officers. Bertram M. Stone, formerly executive vice-president, becomes president, succeeding Joseph P. Bader. Robert E. Bader was named vice-president and treasurer. Dr. Roger Gilmont, technical director, was elected a director.

Helipot Corp., South Pasadena, Calif.—The company announces the appointment of the newly formed firm of Eltron Engineering Sales as exclusive sales representative for the New England states. Eltron Engineering, 246 Walnut St., Newtonville, Mass., is headed by Eugene Burroughs, formerly of the company's engineering staff, and Leonard Schley.

Arthur D. Little, Inc., Cambridge, Mass.—Dr. Marcello L. Vidale, physicist, has recently joined this industrial research and consulting firm. Dr. Vidale will be with the Operations Research staff.

Dr. Cyril C. Herrmann has recently joined the Business Research staff of the firm. He will be in charge of area development for the company and will head up a project for the state of West Virginia.

Palo Laboratory Supplies, Inc., New York, N. Y.—The company announces the election of H. Wechsler as president. Mr. Wechsler has been associated with this industry for over thirty years. Charles Silveira was re-elected vice-president and Richard M. Levin was elected treasurer.

Scientific Supplies Co., Seattle, Wash.—The company has announced the opening of new offices and warehouse at 600 Spokane St., Seattle 4, Wash. This expansion provides modern handling and service facilities together with increased warehousing space.

INSTRUMENT NOTES

Photofluorometer—A new Photofluorometer has been announced by Coleman Instruments, Inc. This instrument, Model 12C, offers a greatly increased sensitivity and improved stability which enable it to deliver accurate data both at very faint fluorescence levels and lower concentrations than those previously convenient to handle. Write for *Bulletin B-230.*

Coleman Instruments, Inc., 318 Madison St., Maywood, Ill.

Precision Pressure Balance—Fast, accurate, nonmanual measurement pressures are accomplished by the new Precision Pressure Balance, Type 37-103, announced by Consolidated Engineering Corp. This portable electronic instrument provides a laboratory standard for precise calibration of pressure pick-ups. For further information contact Public Relations Dept.

Consolidated Engineering Corp., 300 N. Sierra Madre Villa, Pasadena 8, Calif.

C & R Tester—An instrument available from Custom Scientific Instruments, Inc. will provide thickness measurements for a wide range of materials. It is claimed that by a selection of pressure feet the tester will meet ASTM specifications for thickness for asbestos, knit goods, woven glass fibers, pile floor covering, solid electrical insulation, paper, rubber, and others.

Custom Scientific Instruments, Inc., P.O. Box 170, Arlington, N. J.

Pressure Cell—A new testing instrument just developed by W. C. Dillon & Co., Inc. measures pressures up to 10,000 lb. This compact instrument will handle an extremely wide range of testing applications such as checking hydraulic and air pressures, measuring journal bearing pressures, and others.

W. C. Dillon & Co., Inc., 14620 Keswick St., Van Nuys, Calif.

Automatic Titrimeter—A new Automatic Titrimeter is available from the Fisher Scientific Co. In mass titrations, this new instrument permits titration data to be obtained in about one minute as compared to a minimum of two to three minutes for the average titration by hand (in

(*Continued on page 87*)

(*Continued from page 86*)

both instances weighing on high-speed direct reading balances). According to the announcement the main feature of the instrument is its versatility.

Fisher Scientific Co., 717 Forbes St., Pittsburgh 19, Pa.

Concrete Testing Machine—A concrete testing machine with a capacity of 350,000 lb ram pressure, designed as laboratory equipment is available from Forney's, Inc. The Model LT-500 consists of a basic machine plus four groups of accessory equipment. It is stated that the machine is built to operate in accordance with ASTM specifications.

Forney's, Inc., 209 Elm St., New Castle, Pa.

Black-Reading Mercury Thermometers—Quick, clear-reading, maximum-contrast visibility of black-on-white is now available in mercury thermometers. QUIKSITE black-reading thermometers, announced recently by H-B Instrument Co. present a jet-black thread against a white background, nullifying the confusing exterior reflections which have formerly made mercury instruments difficult and slow to read. Detailed information in Catalog 19-A available on request.

H-B Instrument Co., American & Bristol Sts., Philadelphia 40, Pa.

Temperature Controlled Jig for Breakdown Testing—A new oven testing jig for use with Model PA-5 Breakdown Tester is announced by Industrial Instruments, Inc. Designed to meet ASTM specifications D 69 and D 119, the new test fixture has positive temperature control, thermostatically controlled. Temperature range is room temperature to 200 F standard.

Industrial Instruments, Inc., 89 Commerce Rd., Cedar Grove, N. J.

Plating Identification Set—Identification Set Model PIA used to positively identify and differentiate between metallic deposits has been announced by Kocour Co. Tests are provided for identifying cadmium, tin, silver, lead, nickel, chromium, zinc, and presence or absence of chromate conversion coatings. A Cadmium Identification Set is also available for those interested in differentiating between cadmium and zinc only. Write for literature.

Kocour Co., 4806 S. St. Louis Ave., Chicago 32, Ill.

Closed Cup Flash Tester—A new Closed Cup Flash Tester for flash tests conforming to ASTM D 56 has been announced by Labline, Inc. This tester, said to be the latest design of its type, embodies built-in Powerstat heat control, die-cast aluminum base, aluminum hot plate, stainless steel burner tip, nickel-plated finish. Described completely in *Bulletin 4070* which also illustrates Pensky-Martens and Cleveland Testers for other ASTM and Federal Specification tests.

Labline, Inc., 217–221 N. Des Plaines St., Chicago 6, Ill.

Lab Dissociated Ammonia Generator—Lindberg Engineering Co. has announced that extensive tests have been completed on the first commercial laboratory size dissociated ammonia generator. This unit, the "Lab-Hyam," is now offered to metallurgical laboratories for test and pilot runs on the following processes: bright annealing electric metals, bright annealing stainless steels; bright annealing or bright tempering of any ferrous or non-ferrous

(*Continued on page 88*)

(Continued from page 87)

metal or alloy, bright copper or silver brazing, and sintering or reducing powder metals requiring a strong reducing atmosphere.

Lindberg Engineering Co., 2450 W Hubbard St., Chicago 12, Ill.

UHF Grid-Dip Oscillator—A Grid-Dip Oscillator for applications in the UHF band is now available from Measurements Corp. Designated the Model 59-UHF Megacycle Meter, this instrument covers the range of 430 to 940 mc. It incorporates a unique oscillator with a split-stator tuning condenser, arranged so that a fixed coupling point is at the center of the oscillator inductance. The oscillator output is either CW or 120 cycle modulated. Linear calibration is provided with a calibration point every 10 mc (individually calibrated) and accuracy is better than 2 per cent.

Measurements Corp., Boonton, N.J.

Scintillation Scaler—Nuclear Research and Development's Model S-1500 scintillation scaler has been designed specifically for use with the modern detectors: scintillation counters. It provides linear amplification from 1 mv to 1 v thereby allowing one to also use this instrument for Geiger or proportional counters with no circuit changes.

Nuclear Research and Development Co., 6425 Etzel Ave., St. Louis 14, Mo.

Low Capacity Testing Machine—For tensile testing of fabrics, fine metal wire, and other materials, a new 200-lb capacity Electromatic testing machine has been announced by the Tinius Olsen Testing Machine Co. Flexure and compression tests can also be made with this universal testing machine. Any one of eight testing ranges from 0.4 to 200 lb is instantly available by flipping the range selector switch. Further information from company.

Complete Spring Assemblies Tested by New Machine—Accurate compression testing of complete spring assemblies is readily accomplished with the new 10,000-lb Tinius Olsen Spring Testing Machine, which incorporates a mechanical recorder. Load is weighed by means of an equal set of levers mounted directly under the table of the testing machine in combination with the Selectorange electronic indicating system. Three testing ranges are standard, and test range can be changed at any time during test, and all ranges have the same zero setting. Additional information upon request.

Tinius Olsen Testing Machine Co., 1120 Easton Rd., Willow Grove, Pa.

Electronic Holiday Detector—The Electronic Holiday Detector, available from Petroleum Instrument Co., is a durable, simple, and lightweight instrument operating from a small 6-v dry battery. The unit may also be used as a stationary detector for yard work. The discharge voltage produces a loud sound when flashing at the point of holiday which can be heard for a distance of 100 ft.

Petroleum Instrument Co., Box 6252, 2200 W. Alabama, Houston, Tex.

Advances in Creep and Stress Rupture Testing—Now available are testing machines for determining the stress required to rupture specimens as well as the creep properties up to rupture. A new 12,000-lb capacity creep testing machine is announced by its manufacturer, Riehle Testing Machines, Div. of American Machine and Metals, Inc. The manufacturer describes a new ball-seated loading clevice which insures that specimen holders are self-aligning. The specimen is accordingly freed from bending moments which give erroneous results. Write for free bulletin.

Riehle Testing Machines Div., American Machine and Metals, Inc., East Moline, Ill.

New Computer Attains 0.005 per cent Accuracy—A new instrument, designed to meet the needs of intricate applications where close computing accuracy is required, has been developed by the Taylor Instrument Co. Called the Transet Computing Relay, it is capable of adding, subtracting, averaging, and ratioing. It can handle up to three separate pneumatic input pressures with an accuracy of one-half of one per cent. Request *Catalog 98097* from company.

Taylor Instrument Cos., 95 Ames St., Rochester 1, N. Y.

Handle-O-Meter—Available from the Thwing-Albert Instrument Co. is an instrument to control purchases-processes. For use where "handle" or "feel" is a factor in the product, particularly by those who make, convert, or finish tissue, nonwoven textiles, and textiles. Results reproducible between operators and instruments. Tests completed in 15 sec. Additional information from company.

Thwing-Albert Instrument Co., Penn St. & Pulaski Ave., Philadelphia 44, Pa.

Blak-Ray (Black Light) Inspection Lamp—A new improved BLAK-RAY (black light) Model 3X-4 lamp designed for use in difficult inspection procedures, in flaw detection, control, processing, for invisible marking, coding, and other manufacturing operations, as well as for agricultural products examination and inspection, is announced by Ultra-Violet Products, Inc., of South Pasadena, Calif. BLAK-RAY "light" is noninjurious, harmless to eyes or skin, and has no deleterious effects on products. BLAK-RAY lamps burn cool, start and re-start with no warm-up or cooling-off period required, and replaceable tubes are rated at 7500 hr. When requesting information please specify proposed application, giving full details, so pertinent data may be sent.

Ultra-Violet Products, Inc., South Pasadena, Calif.

Magnetic Stirring Bars—Kel-F Coated—Consisting of Alnico type V, cylindrical, permanent magnet sealed in a transparent, durable shell of Kel-F, a polymer of trifluorochloroethylene. This noninflammable thermoplastic, suitable for use at temperatures from −200 to +200 C, is unaffected by prolonged exposure to strong and weak acids, including concentrated sulfuric, hydrofluoric, and hydrochloric acids, fuming nitric acid, aqua regia, and other powerful oxidizing agents, concentrated alkalies, mineral oils, and most organic solvents. Three sizes of Kel-F coated, magnetic stirring bars are offered: $7\frac{1}{8}$ by $1\frac{1}{4}$ in., $1\frac{5}{8}$ by $\frac{5}{16}$ in., and 2 by $\frac{5}{16}$ in. For use with A.H.T. Co. Specification Magnetic Stirring Apparatus as described in illustrated four-page *Bulletin 118* available from company.

Arthur H. Thomas Co., 230 S. 7th St., Philadelphia, Pa.